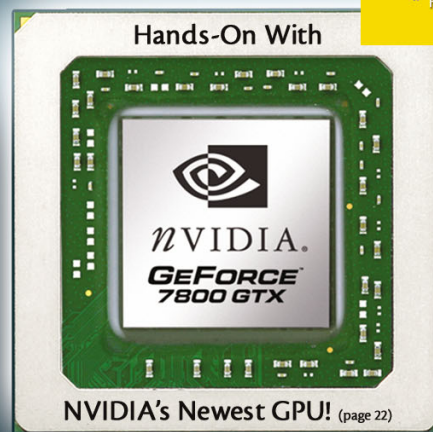


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COMPUTER POWER USER



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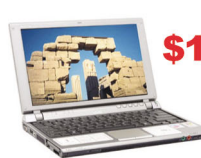


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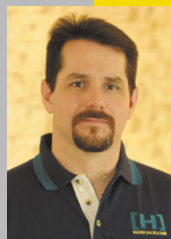
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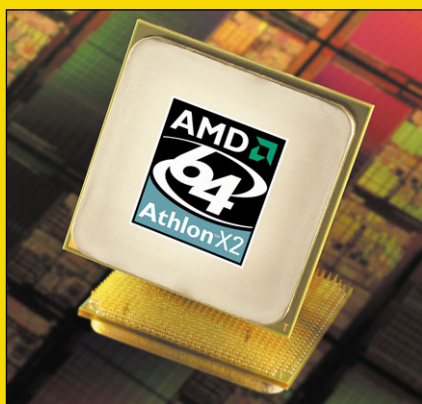
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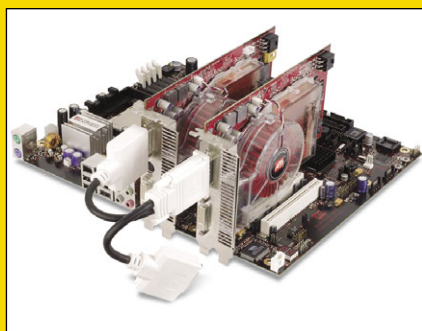


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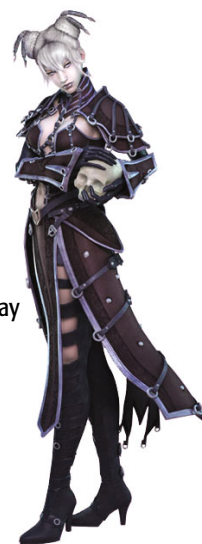
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Infinite Loops

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CORRECTIONS: July 2005 (page 18): Our review of Alienware's Aurora: "Star Wars" Edition PC include incorrect 3DMark scores. The correct scores are: 4807 (3DMark05) and 11980 (3DMark03).

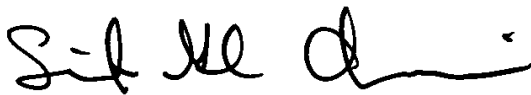
June 2005 (page 58): In case you were wondering about the SPECviewperf scores in our workstation roundup: vsync was enabled.

GREETINGS FROM SAMITLAND

Hey, hey, hey, nice to see you again. It's always a pleasure welcoming you back into the tech fold that we call *CPU*. As you can see from the table of contents, we have a lot going on this month. First and foremost is our coverage of everything dual-core. That starts on page 50, but on the way there you may wish to read our final Athlon 64 X2 and Pentium D 800 series reviews on pages 25 and 26, respectively. Deeper in our Spotlight section (page 60 to be exact), you can catch up with the latest dual-core-friendly motherboards and chipsets. The time to upgrade (winter holidays) is coming on fast, so you might as well be prepared, right?

If you jump to page 102, you'll see a new column called "The Hot Spot." Think of it as a rotating guest spot where we'll feature industry experts with palaver on the mind. This month's guest is Voodoo Computers' top dawg, Rahul Sood. You'll probably be seeing him back again with some regularity. (Perhaps once every other month, if I was doing juju and staring into a crystal ball.) I'll be looking for people with very unique slants on the industry. At any rate, I'd like to get your feedback, and please do send along suggestions of people you'd like to see as guests. We'll create a list, and it'll be a bank to draw from. Appreciate your help. And of course we've got the usual bevy of articles this month that you enjoy, so you'll find plenty to occupy your time as your sit on the air conditioning vent.

Oi, and my birthday's coming up fast so I was trying to sort out what I'd ask the lurvely Wife Choudhuri for this August once she returns from the CDC and before she jets off on the Polio Stop Program for the WHO (World Health Organization). Naturally, you're free to chip in, too. Though it's early, I'd be happy to unload a ticket to the 2006 World Cup Soccer final in Germany next summer if you have a spare—or an HDTV to watch the games. You'll have my thanks; I'm currently holding out until May/June 2006 to purchase mine. My cousin bro is heading to Berlin for the games, and I thought it would be nice to pop in and surprise him for the final match. Anyone? (Is it me, or can anyone else hear the wind whistling over the Nebraska plains?) Then there's that desire for dual-widescreen 23 or 24-inch LCDs (anyone have one with an 8ms response time waiting in the wings?) and ATI's upcoming R520s running in CrossFire (platform preview on page 20) or NVIDIA GeForce 7800 GTX cards (page 22) in SLI. Guess that's fodder for a future roundup. Well, time I did something useful, like maybe getting this issue off to our printing presses. See you next month!



Samit G. Choudhuri, Publication Editor, *CPU*



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Gotcha.
Here it is.



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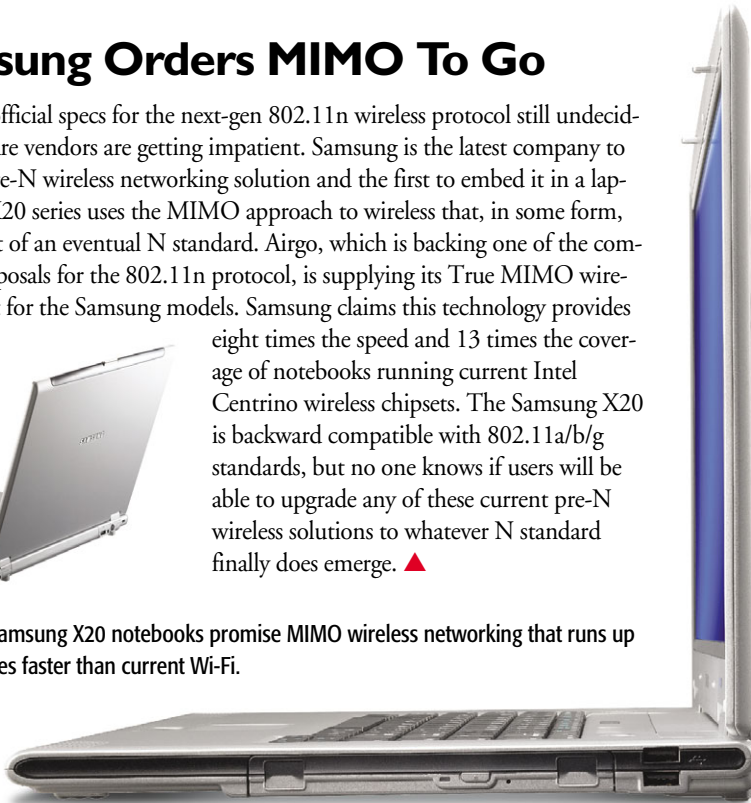
Tel. 510.668.0368 Fax. 510.668.0367

Samsung Orders MIMO To Go

With the official specs for the next-gen 802.11n wireless protocol still undecided, hardware vendors are getting impatient. Samsung is the latest company to release a pre-N wireless networking solution and the first to embed it in a laptop. The X20 series uses the MIMO approach to wireless that, in some form, will be part of an eventual N standard. Airgo, which is backing one of the competing proposals for the 802.11n protocol, is supplying its True MIMO wireless chipset for the Samsung models. Samsung claims this technology provides eight times the speed and 13 times the coverage of notebooks running current Intel Centrino wireless chipsets. The Samsung X20 is backward compatible with 802.11a/b/g standards, but no one knows if users will be able to upgrade any of these current pre-N wireless solutions to whatever N standard finally does emerge. ▲



The latest Samsung X20 notebooks promise MIMO wireless networking that runs up to eight times faster than current Wi-Fi.



Computing In The Round: Z800 3D Visor

Along with reliable speech interfaces and retinal scanning, computer headset displays are one of those long-promised sci-fi technologies that never seem to make it out of the lab. By the time you read this, however, \$899 could buy you eMagin's (www.emagin.com) Z800 3D Visor. The two 0.59-inch OLED eyepiece displays create a 3D view of your PC data that looks like a 105-inch movie screen viewed from 12 feet, according to the company. When you turn your head in this visor, sensors track and virtualize the movement in the display, so that when you look around at other virtual monitors or across long stretches of screen data, they surround you a full 360 degrees. Great! Imagine a world of cubicle-dwellers all wearing visors and spinning in their seats. Futuristic or just creepy? ▲

Talk about immersive. The Z800 3D headset can surround you with 360 degrees of screen data.



Bill Gates shows a prototype of an ultra-mobile Tablet PC. Meanwhile, Nokia released its own Linux-based 770 Internet Tablet.

Are Smaller Tablets Easier To Swallow?

It's time to get small. Both Microsoft and Nokia are squeezing the Web browsing and PC experience into tighter, lighter packages. Nokia's 770 is a Linux-based Internet Tablet that weighs about eight ounces and handles browsing (800 x 480 resolution), email, Internet radio, and even VoIP over Wi-Fi. Meanwhile, Bill Gates showed off an "ultra-mobile PC" prototype at the recent WinHEC 2005 conference. Code-named Haiku, the form factor is somewhere between PDA and ultra-light notebook: one or two pounds, a seven-inch screen, pen input on a Tablet PC version of the upcoming Longhorn OS, internal hard drive, and all-day battery life. Microsoft is looking for hardware OEMs to manufacture Haiku for between \$500 and \$800 and launch it sometime after Longhorn emerges . . . whenever that is. ▲



One Battery For All Needs

The more portable devices you lug around, the more you may need the Socket Mobile Power Pack (\$149; www.socketcom.com). Just charge up this high-capacity Li-Ion battery (7,200mAh) and use it on the road to provide multiple recharges for everything from an iPod mini to a Nokia cell phone. Some devices require connection adapters, but the MPP works out of the box as a universal spare battery for portables that draw juice from a USB port, including most digital cameras, BlackBerrys, and even GPS receivers. The company claims it can run a typical Pocket PC with backlighting and accessories for 16 hours, which means that now we finally can play those marathon sessions of Age Of Empires on our PPC. ▲



The Socket Mobile Power Pack is a universal spare battery for a veritable harem of rechargeable devices.

Hardware Mole

Sponsor A \$69.95 PC

Mobile phone carriers subsidize the cost of cell phones for subscribers, so why shouldn't ISPs underwrite the cost of PCs? In a partnership with Microtel, EarthLink lets new premium dial-up customers get a basic AMD Sempron 2200+-based PC (256MB RAM, 40GB HD, and 52X CD-ROM) running the Xandros Linux OS for \$69.95. An Athlon 64 model is also available for \$511 and a notebook for \$399 with a 12-month EarthLink contract. Microtel also sells Windows PCs with the EarthLink discount, and they only run \$60 to \$80 more than the Xandros versions. ▲



At \$69.95, Microtel's AMD PC definitely doesn't do Windows.

15GB Of Writeable HD-DVD-R Goodness On The Way

Even if it takes hours to write 15GB of hi-def data to a write-once HD-DVD optical disc, we'll wait for this kind of tech coolness. Toshiba, Hitachi, and Mitsubishi/Verbatim have developed a new dye that allows the blue-ray laser in next-gen HD-DVD systems to write up to 15GB on an affordable disc. Unfortunately, the Toshiba-led HD-DVD group seems to be signaling that, despite recent reports, it will not compromise with Sony's rival Blu-Ray DVD format. The two apparently incompatible next-gen DVD formats are scheduled to confuse the market in spring 2006. ▲

Seagate Lands A 500GB Barracuda

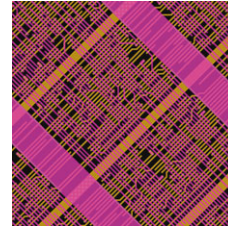
Just for the record, the upcoming Seagate 500GB Barracuda 7200.9 SATA drive will theoretically fit up to 500 hours of standard-res TV footage (or 20 days of 24/7 recording). That's one big fish. Mobile users shouldn't feel left out because, according to Seagate's game plan for late-summer releases, a Momentus 5400.3 model will be the first 2.5-inch notebook drive to use perpendicular storage technology to achieve 160GB of space. Gee, that would be only about a week of nonstop video. Ah well, the compromises of being mobile. ▲



How high can it go? Seagate's next notebook drive hits 160GB, and its desktop drive is a 500GB Barracuda.

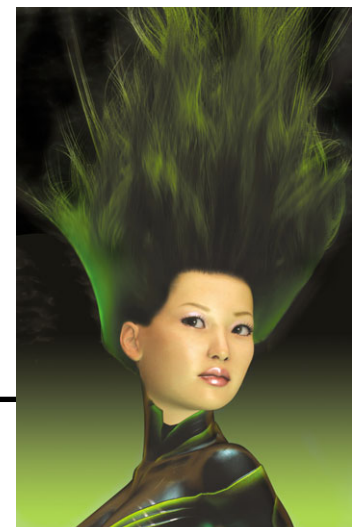
X Architecture Reduces Wiring Costs In Chips

For years, chip makers have created wiring for chips as complex as the traffic grid of Manhattan. But all that time they've only been able to create electrical wires that are the equivalent of horizontal or vertical streets. Now the makers of X Architecture (Cadence Design Systems, ATI, and TSMC [Taiwan Semiconductor Manufacturing Company]) have figured out a way to smooth out the gridlock with diagonal wires. The project started four years ago, and it required chip makers, chip design software makers, and chip manufacturing equipment companies to coordinate, says Greg Buchner, vice president of engineering at ATI. The technology is akin to introducing a diagonal Broadway street into the traffic grid of Manhattan. By retooling Cadence's chip design software and TSMC's chip-making technology, the companies enabled ATI to redesign a mobile graphics chip so that it could run faster, shave costs, and reduce power consumption. If you can find a path through a complex grid by taking diagonal routes, you can get where you are going faster, and performance goes up. Also, you can cut the amount of wiring needed in a chip by 20%, the companies say. ▲



NVIDIA Comes Through With The RSX Reality Synthesizer

Sony's PlayStation 3 demos surpassed the competition at the E3 video game trade show because of the phenomenal floating-point performance of NVIDIA's RSX Reality Synthesizer. Demos, such as one featuring the female character Luna, helped the PS3 steal the thunder of Microsoft's Xbox 360 and Nintendo's Revolution. The chip has more than 300 million transistors (more transistors than in the key chips of all three current-generation consoles combined). It boasts 1.8TFLOPS of floating-point power performance, and on demos such as Unreal Tournament 2007 and KillZone 2, it showed what it can do in combination with the Cell microprocessor designed by Sony, IBM, and Toshiba. "It's going to help Sony take games to a whole new level," says Jen-Hsun Huang, CEO of NVIDIA. ▲



Nethra Seeks A Smarter Eye For Camera Phones

More than half of all cell phones come with cameras, but most of them have an unacceptable 1MP resolution. That's why Nethra Imaging is creating new image processors for cell phones that could pack 3MP or better resolution, as early as next year. So far image processing has been overlooked in camera phones and relatively weak image processors have been built onto image sensors that capture the data. By separating the image processor onto a second chip, Nethra believes it will more quickly convert data into the proper JPEG formats at high speeds. Ramesh Singh, CEO of Nethra, says that Nethra can enable much better resolution pictures that consumers will want to save and print, as well as better video recording on a cell phone. If Nethra's chips are good enough, they will help camera phones in their quest to kill off standalone digital cameras. ▲

Watching The Chips Fall

Here is pricing information for AMD and Intel CPUs.

* Retail price
** Manufacturer's price per 1,000 units
Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com

CPU	Released	Original price	Current price	Last month's price
AMD Athlon 64 3200+	9/23/2003	\$417**	\$178	\$178
AMD Athlon 64 3400+	1/6/2004	\$417**	\$169	\$183
AMD Athlon 64 3500+	6/1/2004	\$500**	\$243	\$255
AMD Athlon 64 3700+	6/1/2004	\$710**	\$327	\$330
AMD Athlon 64 3800+	6/1/2004	\$720**	\$359	\$359
AMD Athlon 64 4000+	10/19/2004	\$729**	\$482	\$482
AMD Athlon 64 FX-55	10/19/2004	\$827**	\$809*	\$809*
AMD Athlon 64 X2 Dual-Core 4200+	5/31/2005	\$537**	\$537**	N/A
AMD Athlon 64 X2 Dual-Core 4400+	5/31/2005	\$581**	\$581**	N/A
AMD Athlon 64 X2 Dual-Core 4600+	5/31/2005	\$803**	\$803**	N/A
AMD Athlon 64 X2 Dual-Core 4800+	5/31/2005	\$1,001**	\$1,001**	N/A
Intel Pentium 4 3.4GHz 800MHz FSB	2/2/2004	\$417**	\$271	\$271
Intel Pentium 4 Extreme Edition 3.2GHz 2MB cache 800MHz FSB	11/3/2003	\$925**	\$847*	\$847*
Intel Pentium 4 Extreme Edition 3.4GHz 2MB cache 800MHz FSB	2/2/2004	\$999**	\$995*	\$995*
Intel Pentium 4 Extreme Edition 3.46GHz 2MB cache 800MHz FSB	11/2/2004	\$999**	\$985*	\$985*
Intel Pentium 4 Extreme Edition 3.73GHz 2MB cache 800MHz FSB	2/21/2005	\$999**	\$1,016*	\$1,016*
Intel Pentium Processor Extreme Edition 840 3.2GHz dual core	4/18/2005	\$999**	\$999**	\$999**
Intel Pentium 4 520 2.8GHz 1MB cache 800MHz FSB 90nm	6/27/2004	\$178**	\$163*	\$163*
Intel Pentium 4 530 3GHz 1MB cache 800MHz FSB 90nm	6/27/2004	\$218**	\$165*	\$165*
Intel Pentium 4 540 3.2GHz 1MB cache 800MHz FSB 90nm	6/27/2004	\$278**	\$189*	\$189*
Intel Pentium 4 550 3.4GHz 1MB cache 800MHz FSB 90nm	6/27/2004	\$417**	\$289*	\$289*
Intel Pentium 4 560 3.6GHz 1MB cache 800MHz FSB 90nm	6/27/2004	\$637**	\$394*	\$394*
Intel Pentium 4 570 3.8GHz 1MB cache 800MHz FSB 90nm	11/15/2004	\$637**	\$659*	\$659*
Intel Pentium 4 630 3GHz 2MB cache 800MHz FSB 90nm	2/21/2005	\$224**	\$202*	\$202*
Intel Pentium 4 640 3.2GHz 2MB cache 800MHz FSB 90nm	2/21/2005	\$273**	\$276*	\$276*
Intel Pentium 4 650 3.4GHz 2MB cache 800MHz FSB 90nm	2/21/2005	\$401**	\$370*	\$370*
Intel Pentium 4 660 3.6GHz 2MB cache 800MHz FSB 90nm	2/21/2005	\$605**	\$610*	\$610*

Hang Ten On Your Couch

Summer's almost over, and if you haven't taken a vacation yet, it's time to start couch surfing. The CouchSurfing Project (www.couchsurfing.com) is a nonprofit venture created for those of us who love to travel and meet new people but can't always find enough change between the cushions to stay in swanky hotels. CouchSurfing is as easy as becoming a member of CouchSurfing.com (free) and locating another CouchSurfing member who lives in a country/city you'd like to visit. You can stay on that member's couch during your vacation or trip and not have to spend a dime. Chat with your potential host online to get to know more about him and his couch, book your flight, and go. But how can you find a quality couch? The Web site offers different

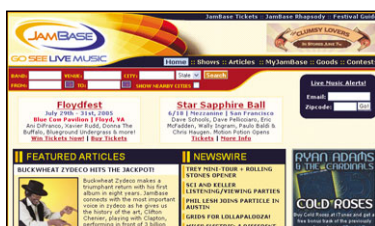


No cash for a summer vacation?
Try surfing some couches.

levels of verification and "vouching" for members' couches, which will help you find a safe couch suited to your needs. In addition, if you decide to become a seasoned couch surfer but don't want others surfing your couch, no problem. You can pick who you want surfing your couch, or you can make your couch completely unavailable. It's all up to you. Surf's up, dude! ▲

Jam The Summer Away

As the summer winds down, you may not feel like traveling too far, but you do want to do something fun in the sun . . . with some good music. Finding live music should be easy with JamBase (www.jambase.com), a Web site where you can locate live music festivals in your area. Type in your city, state, favorite band, and venue; check out the newswire for the latest updates; or just click Shows for all the latest shows in and around your hometown. ▲



Learn To Do Anything . . . Almost

You bought the Ferrari 612 Scaglietti in red? Good choice. But now you've to change the oil to keep that baby running at top speed. Not quite sure how to change the oil in your new car? Check out eHow (www.ehow.com) to learn how to do it and almost anything else. Type **change oil**

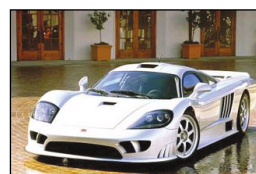


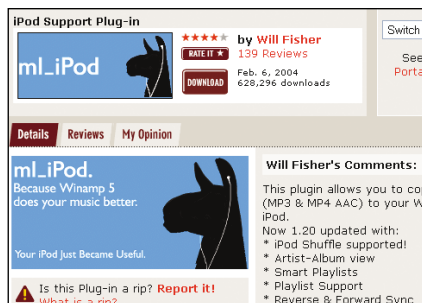
Learn how to do almost anything
at eHow.com.

in the search field, and eHow will locate various articles on the Web to help you change the oil in your vehicle. However, if you're driving the 612 Scaglietti, you might not be changing the oil yourself. So, what looks better in red than you? How about you and a beautiful date? Exactly. Type in **how to date**, and you'll find information on how to dress for a date, plan a date, and even read your date's body language. And, just in case you read that body language correctly, you should check out the info on how to kiss. ▲

Exotic, Luxurious Zoom! Zoom!

We thought that headline would get your attention. Forbes.com has launched its new auto site, ForbesAutos.com (www.forbesautos.com). The interactive site is loaded with luxury autos that will blow your current vehicle's doors off (or blow your bank account). Check out the photo galleries to find everything from extravagant trucks, such as the 2005 Cadillac Escalade EXT, to a rare and striking sports car, the 2005 Saleen S7. After window shopping, you can swing by the Decision Guides, Reviews, and Advice sections to decide if the red 2005 Ferrari 612 Scaglietti or the silver fits your style better. So, if you're in the mood for a new automobile (or just like to check them out) and love luxury cars, drive by ForbesAutos.com and be prepared to clean the drool off your keyboard. ▲

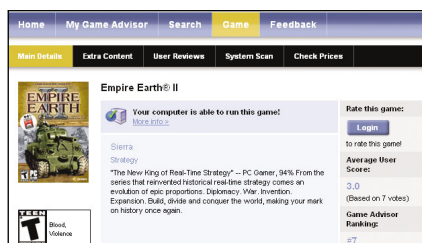




Winamp tweaks the iPod with a new plug-in.

Winamp Can Speak iPodese

Savvy iPodders who are frustrated with managing their Apple device exclusively with iTunes are flocking to the new iPod Media Library Plugin (aka ml_iPod; www.mlipod.com) for Winamp. The free download lets the software move playlists to the device, sync multiple iPods, and also do something iTunes can't, copy tracks from an iPod to a PC. User kudos keep pouring in to Will Fisher, the UK computer science student who currently develops ml_iPod, which was written originally by Winamp founder Justin Frankel. Fisher's plug-in also overcomes iTunes incompatibility with older versions of Windows. For its part Apple remains silent about this apparent breach of its (in)famous proprietary hold on iPod, but it's rare for the ultra-hip firm to get outclassed on the usability front. ▲



Microsoft's new game advisor lets users rate and review PC titles, as well as find the ones that fit their system's capabilities.

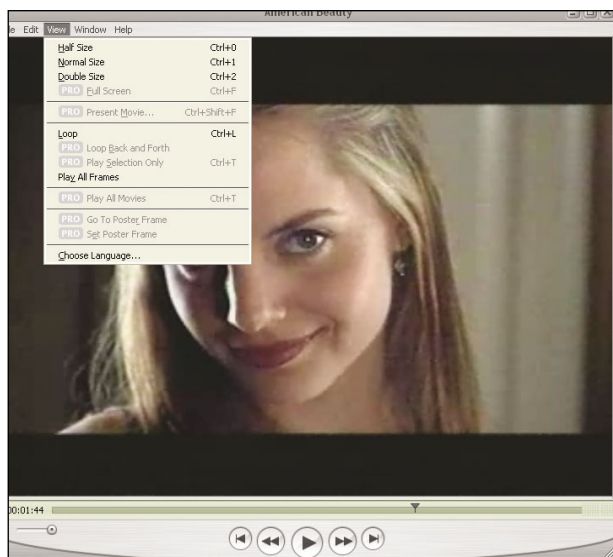
Microsoft Gives Gamers A Voice

PC game sales continued their decline in 2004, but Microsoft is not about to turn the lights out on this venerable platform. The Windows XP Game Advisor 3.0 (www.windowsgaming.com) keeps players at their desktops by finding game titles that fit their tastes and hardware. The Web-based tool uses FutureMark benchmarks to evaluate your system's CPU, 3D accelerator, and memory and then match your rig with compatible games. The FutureMark tool also compares your PC's specs to others, so you can get a coveted WWo! performance rating, if you are into that sort of thing. Version 3.0 now lets players talk back by rating titles and posting reviews. Game Advisor requires Internet Explorer 6. ▲

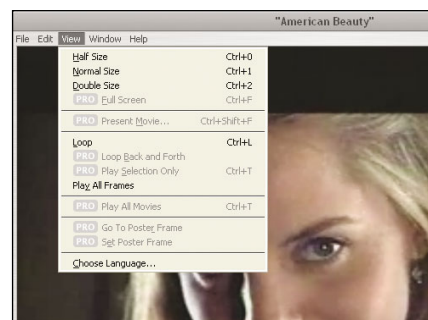


Apple Wants You To Turn QuickTime Pro

With the release of the QuickTime 7 public preview, Apple initiates a major push to get users of the free player software to upgrade to the QuickTime 7 Pro at \$29.99 (www.apple.com/quicktime/pro). The QT 7 menus teased us with the Pro version's full screen playback and editing features. Actually, QT 7 Pro is as much for talented amateurs as it is for pros because the upgrade can import vidcam footage, encode hi-def H.264, and create 5.1 audio soundtracks. You can even output footage in 3GPP and 3GPP2 formats, which are used to stream video across wireless broadband networks, including 3G phones. Well, we may not be ready to share home video over our phones, but we're happy just to get full-screen QuickTime playback in this Pro version. ▲



The new free QuickTime Player hard sells the features of the \$29.99 Pro upgrade.



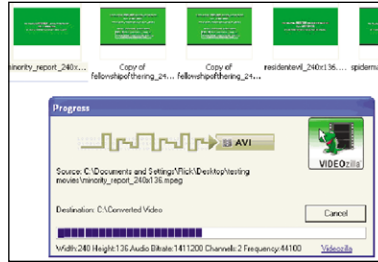
Software Shorts

Mmm! Videozilla Eats Movie Formats For Lunch . . .



. . . and spits them out in just about any other format you like. The effortless Videozilla (SoftDiv, \$29.95; www.videozilla.net) media morpher is now in version 1.4 and integrates conversion commands into the Windows Explorer interface. Right-click a MOV,

ASF, XviD, or almost any video file in any folder and use the context menu to turn it into an AVI, MPEG, WMV, or RM (RealMedia) format. The upgrade adds audio extraction, which sucks soundtracks right out of supported video types and spews them out as MP3 or WMV files. Yumm. DivX. Videozilla wants more! ▲

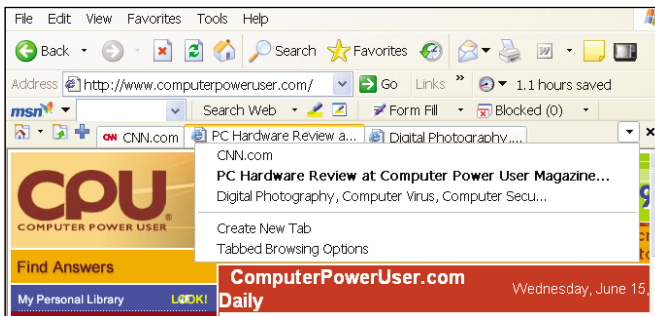


Right-click a video file and convert it to another format with Videozilla.

Get A Jump Start On IE 7

Microsoft is expected to release a beta version of Internet Explorer (version 7) for Windows XP SP2 sometime soon, but you can get at least one of its promised features now: tabbed browsing. The MSN Toolbar 2.0 (toolbar.msn.com) adds a new optional toolbar to IE that opens links as additional tabs in the same IE window. You can even assign the current group of open sites as

My Tabs, a cluster of favorite URLs you can open together with a single click. ▲



Finally, Internet Explorer gets tabbed browsing with a new MSN Toolbar.

Skype Gets In Your Face

With Dialcom's (www.dialcom.com) new Spontania plug-in for Skype (www.skype.com), the wildly popular P2P VoIP service becomes a free video-phone network. The video4skype plug-in adds a toolbar and



pop-up box that controls your own Web cam and invites the person on the other end of your Skype call to activate hers for a live audio/video exchange. Spontania offers five video quality settings, dual screens to show both local and remote Web cam views at once, and a full-screen mode for genuine in-your-face exchanges.

BIOS Upgrades Available Online

Compiled by Kevin Savetz

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new outlook on life. Here are a few recently released upgrades. Readers can check out www.cpumag.com/cpuAug05/bios to see our entire upgrade list.

Motherboard	Date Available	URL
ABIT NF7-S2	06/15/2005	www.abit-usa.com/downloads/bios/bios_revision.php?categories=1&model=204
AOpen s661FXm-7S	06/13/2005	download.aopen.com.tw/userdownload_List.aspx?RecNo=9743&Model=s661FXm-7S
ASUS A8N-E	06/12/2005	support.asus.com/cpusupport/cpusupport.aspx
Chaintech VNF4/VNF4 Ultra	06/03/2005	www.chaintechusa.com/tw/eng/Download/dl_desc.asp?DCSNo=4&PISNo=318
ECS 945P-A	06/07/2005	www.ecsusa.com/downloads/downloads_main.cfm?to=Motherboard
ECS PF5 Extreme	06/07/2005	www.ecsusa.com/downloads/downloads_main.cfm?to=Motherbo

Compiled by Steve Smith

The Job Search

Want to get far, far away from it all and still practice your tech skills? Try Ascension Island (population 1,100), a 35-square-mile dot in the middle of the Atlantic Ocean. Raytheon needs a Communications Specialist there who can navigate digital switching and data communications technologies. Because Ascension Island has long been an important hub for maritime and satellite communications, you'll need everything from soldering skills to experience with cryptographic equipment. When you're not calibrating or installing instrumentation, enjoy the mild 60- to 80-degree climate, the famous green turtles, and total solitude. The small island boasts about one incoming and outbound flight per week and a monthly visit from the UK's Royal Mail Ship. A good job for those who want to disappear.

RAW DATA

12.4%

Percentage of Internet users who set their browsers to reject cookies.

WebTrends



22%

The share of installed software on U.S. PCs that is pirated.

Business Software Alliance

7.4%

Percentage of U.S. broadband users who downloaded a full-length feature film to their PCs in 2004.

Yankee Group



571

Average number of minutes per month men talk on their cell phones.

Cingular



424

Average number of minutes per month women talk on their cell phones.

Cingular

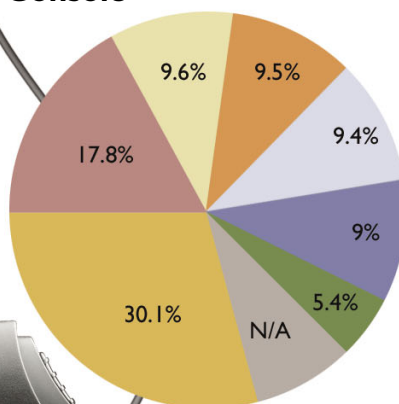
Is This The End Of PC Gaming?

The sales gap among gaming platforms has grown so wide that pundits are asking once again if PC play is suffering a slow death. With game unit sales down from 52.8 million in 2003 to 45 million in 2004, the PC seems to be getting blown out of the arena by video game sales (203 million units in 2004, up from 186.4 million in 2003, according to the NPD Group). Fear not, says industry Yoda and Atari founder Nolan Bushnell at a recent games conference. Emerging digital entertainment markets such as China will need games on platforms that offer better security than consoles, which are widely hacked in Asia. "There is huge money to be made there in RPGs with secure computers," he says, and upcoming OSes such as Microsoft's Longhorn could give PC gaming a new edge and a new life.

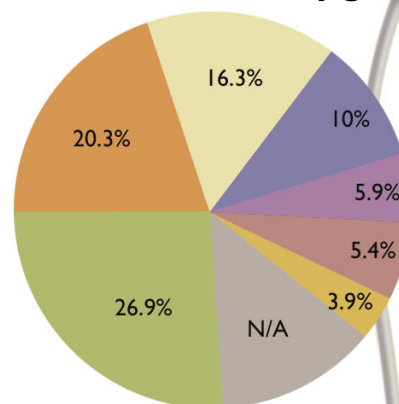
PC vs. Consoles: Best-Selling Game Genres

Console games may be outselling PC titles three to one, but a breakdown of sales by unit sales in genres shows that desktop play is still the more cerebral pursuit.

Console



PC



- Action
- Sports
- Fighting
- Role-playing
- Adventure
- Shooters
- Racing
- Family/Children
- Strategy
- N/A

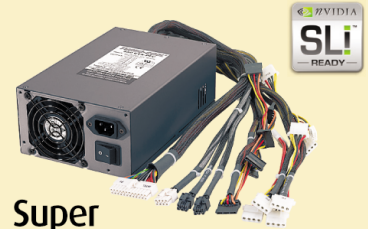
Sources: NPD Group/NPD Funworld/TFSTs

Heavyweight Champ.



Dual PCI Express
Connectors
Includes 24-pin to
20-pin Adapter

Turbo-Cool® 510 Express/SLI



Super Heavyweight Champ! Turbo-Cool® 850

Introducing the Turbo-Cool 850 SSI, the biggest, baddest power supply available for next-gen computers! It produces 950W of peak power, handles brownouts down to 80VAC, and delivers voltages 10 times more stable than ordinary units. Perfect for dual-CPU, dual-video systems and up.

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- Ultra-Tight Regulation (+VDC @ 1%)
- Amazingly Quiet Cooling System
- Dual PCI Express Video Connectors
- 15 Drive Connectors (incl. 6 SATA)
- Unbeatable 5-Year Warranty

"Our Top Pick for a High-Wattage PSU is the Turbo-Cool® 510" —Maximum PC, April 2005



Power Packed!

Forget modular plugs, neon lights, and other superficial gimmicks. When it comes to power supplies, it's performance and reliability that count, and nothing beats the heavy-duty Turbo-Cool® 510. The first PSU certified for use in nVidia SLI systems—and guaranteed to easily power *any* system—the Turbo-Cool® 510 continues PC Power & Cooling's 20-year legacy of producing heavyweight champs.

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- The Highest +12VDC Output (34A, 38A Peak)
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- The Cleanest Power (+VDC Ripple @ 0.5%)
- The Industry's Strongest Warranty (5 Years)

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DirectX 10th Anniversary

This September is the 10th anniversary of DirectX. Myself and two friends, Craig Eisler and Eric Engstrom, conceived the notion that Microsoft should create a game SDK for the forthcoming Windows 95 OS. We wrote a document called "Taking Fun Seriously," proposing our strategy for making the Windows OS a leading game platform. The proposal was politely rejected, so naturally we did it anyway with resources we begged, borrowed, or stole from other groups. We originally conceived of DirectX as a stealth strategy to help PCs dominate the living room and displace ubiquitous consoles from Sony, Sega, and Nintendo. Naturally the project was code-named "The Manhattan Project," and we chose the radiation symbol as our logo. In early December 1994, a handful of the PC game industries' leading developers convened at Microsoft campus to participate in the design review for what would become DirectX 1.0. Attending developers were issued glow-in-the-dark, neon "Manhattan Project" T-shirts.

We had a beta release of the technology in time for the March 1995 Game Developers Conference. The conference refused to allow Microsoft to announce the technology there, so I ended up renting the Great America Theme Park across the street from the event and threw a wild party called Ground Zero, which was attended by more than 1,500 developers. DirectX 1.0 included DirectDraw for 2D graphics; DirectSound, which was prototyped for us by game industry legend John Miles; DirectInput for joysticks and gamepads; and AutoPlay.

For DirectX 3.0 we acquired UK-based RenderMorphics to create Direct3D, after Microsoft internal politics prevented us from porting OpenGL from Windows NT to Windows 95 to enable consumer 3D graphics for consumers. The now infamous DirectX radiation symbol had been morphed into an "X" with a neon background, for the sake of political correctness. By 2000, all three of us had left Microsoft for greener pastures, but the DirectX

legacy remained. After a failed attempt to work with Sega to create a DirectX-based OS for the Sega Dreamcast, Microsoft decided to make its own game console, the "DirectXbox." (Read "Opening the Xbox" by Dean Takahashi.) A little marketing refinement left only the name "Xbox," with the radioactive neon X on its cover and eerie neon UI.

Ten years after the start of the "Manhattan Project," Microsoft is poised to drop its next-generation game console on the world, and I have to wonder if anybody at Sony and Nintendo is getting that sinking feeling that Netscape must have experienced when it woke up one day undeniably confronted by the possibility that Microsoft had come from behind with a better browser and a better strategy and snatched the rug out from under it. When Microsoft named the Xbox360, I suspect it meant "Xbox Full Circle," as in, this product is the conclusion to a 10-year plan for Microsoft to dominate the living room via games.

When first I heard from former colleagues at Microsoft about the plans to launch a DirectX console, I have to admit that I was highly skeptical that Microsoft could pull off such an ambitious effort. The media like to point out that the Xbox couldn't beat the Sony PS2, but nobody mentions what a near miraculous feat it was for Microsoft to beat Nintendo and place second against the deeply entrenched PS2. For its first try, Microsoft punched a hell of a hole in the console business. Microsoft has a long history of learning fast from its mistakes and it had plenty of time to learn from Xbox-1 (which I'll talk more about in a future column).

This time around, Microsoft is taking the lead in the market by launching first, declaring the battlefield to be all about online gaming support (in which it has a dominating lead), and working hard to attract leading console game publishers instead of trying to compete with all of them from Microsoft Game Studios. It's a powerful strategy and a worthy 10th anniversary present for DirectX. (The logos below—a coincidence? I think not.) ▲



Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is President and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

For its first
try, Microsoft
punched a
hell of a
hole in the
console
business.



Radiation
Symbol



DirectX
Logo



Xbox
Logo



Xbox 360
Logo

Send your thoughts to TheSaint@cpumag.com.

DREAM HARDWARE

These Gizmos
Don't Sing It,
They Bring It



We're just a Powerball away from retreating to our own little world with this month's exercises in excess. First, we'd turn a laser on some old Kinks LPs. Next, we'd tee up for a round of golf in our living room. And finally, we'd pretend to go win a few worlds with Wolf's Dragoons in our towering 'Mech.

by Marty Sems

ProTee 2005 Professional System Golf Simulator

Get yourself a big stick and swing it at the dirt. ProTee's 2005 Professional simulator (www.protee-united.com) brings out the Tiger in you. It tracks fast enough to give you excruciating detail about your swing, as you use your own unmodified clubs. It renders in real-time, too, so there's no more waiting for an obsolete sports bar sim to draw the next view. You can buy into this game, fully equipped with a custom PC and ceiling-mounted projector, for about \$20,120. And when you tire of the preprogrammed courses, you can design your own. It's probably just a matter of time before somebody posts a Groundskeeper Carl mod with gopher rifle and plastic-explosive animal hazards.

Sakakibara Kikai Land Walker

Few things have reduced us to such inarticulate "Beavis & Butthead"-style "Huh . . . huh-huh . . . huhs" like this thing. Perhaps best known for its dairy milking machines, Japanese manufacturer Sakakibara Kikai took the next logical step and made a Battlemech. (Is that more of a Catapult or a Stalker?) This 11-foot titan scissors across level surfaces by cross-country skiing in slow motion (at about 1mph), but in our gleeful, adolescent minds it's already out stomping main battle tanks and hovercraft. The Land Walker has mock cannons that track with the pilot's joysticks and shoot squeezable purple balls for fun. If one of these ever shambles over to these shores, expect to pay upward of \$335,000 (www.sakakibara-kikai.co.jp). In the meantime, check out the movies on the site of the Land Walker at play.



ELP Laser Turntable LT-2XRC

Even the record store vinyl snobs in the film "High Fidelity" might put one of these on their Top 5 list of audio equipment. The LT-2XRC (\$18,999) is the best of both worlds. It's a fully analog turntable, so stacks-of-wax purists won't be offended by any sort of soulless, digital processing. Yet it uses a harmless laser to read the grooves in a record (33 to 78rpm, 7- to 12-inch discs) rather than a physical needle, so those precious LPs won't degrade with every play as they normally do. Audio Turntable (www.audioturntable.com) distributes these in the United States for ELP (www.elpj.com). Unless we're wrong about everything, everybody's gonna be happy with a laser turntable like this.



The Outer Limits Of Everyday Computing

Where Hardware & The Future Collide

Do you sit for eight hours a day at a desk, plodding along with Web portals and productivity apps on beige boxes? Is that Centrino, once so cool and cutting edge, now overly ordinary? Has even your mack-daddy LAN-party rig graduated from bling to bland? Maybe you just need some inspiration on how to inject some fresh technology into your life. And when we say fresh, we mean out there—this stuff is either just peeking over the horizon or is so different from the norm that you'll wonder if it's just what you've been looking for, but didn't know it.

by William Van Winkle

Meet The Palmtop

If PDAs seem too clumsy for data entry, BlackBerries too limited in their applications, and notebooks or tablets too big to be convenient, maybe you're ready for a palmtop. OQO's model 01 measures a measly 3.4 x 4.9 x 0.9 inches (HxWxD)—smaller than most paperbacks—and weighs only 14 ounces. The capacitance-sensitive (stylus-based), transfective, 5-inch LCD offers 800 x 480 resolution and slides up to reveal a QWERTY thumb keyboard with integrated TrackStik pointer and numeric keypad. If you can manage a smart pager's keyboard, you'll find OQO's version expansive.

Thanks to a 1GHz Transmeta Crusoe CPU, 256MB of DDR memory, and a 20GB 1.8-inch hard drive, the model 01 comes running Windows XP. Between the 802.11b, Bluetooth, 1394a, and USB 1.1 connectivity, you can find several ways to install Windows-compatible applications. A bundled docking cable provides for accelerated 1,280 x 1,024 output, as well as 10Mbps Ethernet, audio out, and more ports.

This unit is really aimed at corporate types who need to stay connected and view files on the road, without being weighed down by a notebook. That said, provided you travel in an area of town not prone to muggings, the model 01 is a stellar way to stay productive or entertained on mass transit. It also strikes us as being a bit more in the spirit of a coffee shop Wi-Fi hot spot. You have room for several full-length DivX movies, days of MP3s, and all the home/office work you can stomach.

Still, this is a first-gen product with a few head-scratchers. Why not 802.11g, 100Mbps Ethernet, or USB 2.0? Why no option for WinXP Tablet Edition? And is a sub-three-hour battery life really the best OQO could do? Conversely, OQO goes for such perks as ambient light sensing for automatic backlight adjustment and active HDD parking in the event of freefall. All in all, not a bad start in a new form factor category. ▲

model 01 ultra personal computer

\$1,899 (with WinXP Home)

OQO

www.oqo.com



Cordless QWERTY

We've played with Bluetooth smartphones for a couple of years, but keypad text entry is too maddening for words, even abbreviated, mangled SMS words. Why in the name of Silicon Valley didn't someone make a Bluetooth keyboard that didn't only make SMS and mobile IM easy but also open up the prospect of quickly composing notes and small documents?

Think Outside, makers of the folding Stowaway keyboard, has an answer: the Stowaway Universal Bluetooth Keyboard. This model folds down the center into a tidy 5.5 x 3.9 x 0.5 package. You get 18mm key spacing with 3mm key travel for a feel that closely resembles a good notebook keyboard. A phone/PDA holder detaches from the keyboard so you can adjust the screen. The keyboard is rubberized to keep it from sliding around and has many programmable shortcuts.

We used the keyboard on Audiovox's SMT 5600 smartphone and a Bluetooth-enabled iPaq. We were nearly giddy with all the time saved. Imagine the Stowaway with the OQO model 01. What student would not want to take notes with such a setup? Or imagine matching Bluetooth keyboards with half-sized, keyboardless tablets. ▲



Stowaway Universal Bluetooth Keyboard

\$149.99

Think Outside

www.thinkoutside.com



Wearables

OK, so maybe today's wearable computers still leave you looking like a Borg reject. Regardless, there are times when you need your hands free but still want to keep computing—or at least keep your computer with you. Think about having to move with crowds of people or the idea of personal, real-time broadcasting that we have seen in many science-fiction books. For this you need some kind of wearable computer (or an embedded one, but we're a *long* way from discussing that).



Xybernaut may not make the sexiest wearables, but the company has a corner on the wearable intellectual property space. Xybernaut's Mobile Assistant V (MA V) weighs only 1 pound and measures 5.9 x 3.5 x 2, clipping onto a vest, suspenders, backpack, or anything similar. The unit uses an ultra-low voltage (1.1V) 500MHz Mobile Celeron backed by 128MB of SDRAM and a 5GB hard drive. Someday, wearables and their

attendant head-mounted displays (Liteye Systems, www.liteye.com, makes some cool models) may let us superimpose gaming scenarios onto the real world, but the MA V can only handle basic 2D tasks with its 8MB of video memory. That's still fine for looking at a map or a streaming video, though.

The Mobile Assistant Transferable Core (MA TC; left) is the slicker spin on the MA V. With the MA TC the CPU, memory, storage, and I/O ports are all part of a removable module that slides in and out of the main wearable enclosure. Thus, you could have different MA TC modules for different applications, such as one for gaming and another for field interviewing. The 400MHz CPU in today's MA TC modules won't dazzle anyone, but you can see how this design principle could be very important in near-future personal computing. ▲



Mobile Assistant V or Transferable Core

Prices vary
Xybernaut
www.xybernaut.com

Got Butterfingers? Tough

Of course, if you need to compute in the field but need more horsepower than a modern wearable can offer, you're back to notebooks. As all long-time notebook users know, though, we humans are fumbling, clumsy creatures prone to dropping \$3,000 of fragile electronics at the slightest provocation, like to return a friend's wave or hit the deck under enemy fire. That's why

Panasonic has spent years becoming the de facto name in ruggedized mobile computing. Chances are that no notebook will survive a three-story swan dive off a balcony, but few computers will take more abuse than a Toughbook.

With its sealed ports and magnesium alloy casing, the T-18 is independently certified to pass military spec MIL-STD-810F, which covers everything from 26 consecutive drops onto plywood-on-steel to 15 minutes under a continuous water drip with the display open and operational. The hard drive even comes shock-mounted in foam or soft polymer wrapped in stainless steel. Call it your little black box away from home.

The Centrino-based T-18 is a convertible design, meaning the touch-sensitive, 10.4-inch display swivels on its hinge, giving you either a traditional clamshell or a rather thick tablet. The CPU is a 1.1GHz Pentium M Processor ULV 733 backed by a 40GB hard drive and 256MB of SDRAM. With the T-18 you can connect anywhere to anything. Bluetooth, GPS, CDMA2000, 3G GSM/GPRS, and 802.11a/b/g are all integrated. Despite the Panzer aesthetics, the T-18 only weighs 4.5 pounds, and that's with its four-to-six hour Li-Ion battery. ▲



Toughbook-18

\$3,699
Panasonic
www.panasonic.com

100 Displays, 1 Server, All TCP/IP

We've been waiting for years, but now the day has come. We're finally going to have monitors with built-in LAN ports. Some vendors are pushing LCD TVs with companion VGA/DVI-to-LAN

adapters. No, no, no. We want the jack in the back, and Samsung delivered by recently announcing its 460pn (46 inches) and 400pn (40 inches) widescreen LCDs. These units offer 1,366 x 768 HD resolution, a laudable 170-degree

horizontal and vertical viewing angle, 500cd/m2 brightness, and an 800:1 contrast ratio. Better yet, response time is a blistering 8ms, so you won't have to worry about ghosting or mushy edges.

As you might expect, the delicious displays will initially target corporate applications, especially signage. Samsung's MagicNet software allows for LAN-based administration of any number of pn model displays. Users can specify which content goes to which monitor(s) and schedule that content for display up to a month in advance. Of course, directories and menus are but a drop in the bandwidth bucket compared to MPEG-2 video and FPS games, and we will suspend judgment on 3D-over-IP until we can see it in action. But imagine the possibilities just in your home: orchestrating TV programming, movies, gaming, jukebox playback, and much more, all with just a few clicks of the mouse. ▲

460pn/400pn

\$8,159/\$6,749

Samsung Electronics America
www.samsung.com



Waterproof LCD Monitor

Prices vary
Man & Machine
www.man-machine.com

When Screen Saver Meets Aquarium

Man & Machine sells some pretty amazing stuff, including everything from handheld explosive vapor detectors (you can never be too careful) to incredibly good LCD antireflective films. But the company also specializes in waterproof PC products, including rubber keyboards and our favorite, a 10.4-inch waterproof LCD monitor. Man & Machine hesitates to call the display "waterproof" because some rocket scientist always comes along asking, "Will it work at a depth of 1,000 meters?" No, and neither will most anything else. But with every nook and cranny of the screen enclosure sealed, it will work at 1-meter depth. However, as company reps pointed out to us, if your computer is 3 feet underwater, you have bigger problems than whether your screen still works.

Every waterproof LCD is built to custom order. Each can be brightness enhanced for outdoor viewing and adapted for use with 12V power. Touchscreen functionality is optional. If we had a boat, rest assured this would be mounted right beside the wheel. Then again we've seen first-hand what small kids can do to computers, and the idea of having a screen that can survive juice spills and bodily fluids with subsequent cleaning via garden hose has a lot of merit. ▲



The Ultimate In HD

When you go from one monitor to two, you think you've died and found data nirvana. Suddenly, you can have two, maybe three, application windows viewable at once. But then you get used to it, and eventually you're back to flipping windows again, tiling one atop the next. Remember that scene in "Swordfish" where the hacker has a workstation pinned under a free-floating cascade of LCD screens? That's what you really need.

Well, this isn't Hollywood, but Digital Tigers has your next-best flat-panel fantasy realized with the PowerTrio HD. One stand supports three LG.Philips displays—a 30-inch widescreen flanked by two 20-inch screens in portrait mode—yielding a 52-inch panorama with a 4,960 x 1,200 resolution. So you could play your HD DVD movies in the middle and still have a pair of 20-inch screens for whatever. All three screens offer 16ms response times, 250cd/m2 brightness, and viewing angles of at least 170 degrees.



If that isn't enough, there's the TigerVista Command Center 17N (\$2,999), a stunning array of 17-inch Samsung LCDs, two high and three wide, yielding an overall resolution of 3,840 x 2,048. Need more? The TigerVista Arena Elite (\$7,999) stacks four 19-inch panels on top of three 21-inch panels. We know these units are aimed at stockbrokers and such, but come on. The possibilities for entertainment simply boggle the mind. And if you're a notebook user, you'll be stoked to know that the company's SideCar box (\$1,299 to \$2,299) uses a PC Card interface with NVIDIA graphics to drive up to four screens, yielding five displays total. We wouldn't call that mobile computing, but who cares? ▲

**TigerVista
PowerTrio HD**
\$6,999
Digital Tigers
www.digitaltigers.com



Run Away!

You can't stay plugged in forever. Eventually, no matter how sweet your computing wizardry is, enough will be enough, and you'll need to hit the road, relax, and maybe run a few laps. adidas is ready for energetic geeks like us with its first-ever CPU-enabled shoe, the adidas_1. This is a whole different spin on the wearable computing concept, but one that seems likely to become popular far more quickly: task-specific wearable technology.

In this case a microprocessor buried in the arch works with a magnetic-sensing system running through the shoe's midsole. The processor monitors the amount of

compression in the midsole 1,000 times per second and thus the amount of compression. If the compression level falls above or below a preset range, a motor in the midfoot tightens or loosens a cable tied to the cushioning element, making the shoe feel firmer or softer as necessary.

Initial impressions from *CPU* staff armed with the adidas_1 are that you really can feel the shoe working as you run, and the stiffness does transition as you move from turf to pavement. The end result is less fatigue at the end of a run. On the other hand, all that extra gear does weigh down the shoe slightly, so be warned if you are used to running in ultra-light running shoes. ▲



adidas_1
\$250
adidas
www.adidas.com

ATI Doubles Down With CrossFire Technology



The chip industry is currently on fire with parallelism. It's everywhere right now; AMD's doing it; Intel's doing it; NVIDIA's doing it; and now ATI has decided to double down and announce its dual graphic card solution technology called CrossFire. Most of us knew it was coming (the only question was when), and, indeed, ATI has been down this road before with some of its workstation-class products and back in the Rage Fury MAXX days (in the late '90s). With the intense marketing effort from NVIDIA to push SLI at the high-end, clearly ATI had to respond.

First, you'll need a platform that supports CrossFire technology. In other words, whether it's an AMD- or Intel-based system, you'll have to buy a motherboard based upon ATI's Radeon Xpress 200 CrossFire edition chipset. This is by no means a bad thing because performance numbers have already shown how capable the Radeon Xpress 200 is as a high-end solution. Boards that support CrossFire will sport two PCI Express x16

slots with x8 electrical connections. Unlike NVIDIA's SLI technology, ATI's CrossFire platform doesn't require the use of a hardware selector card or any specific jumper settings because the motherboard's BIOS controls all options. Also, ATI states that you'll be able to run CrossFire on Intel-based boards and is in talks with NVIDIA about adding support for nForce chipsets; however, I won't be holding my breath for the latter. Although a little off-tangent, this is a nifty possibility with the Intel platform boards, if OEMs choose to implement IGP, and, in theory, you'll be able to run five monitors at a time via ATI's SurroundView technology.

Onboard With The Board

In order for CrossFire to work, you obviously need two ATI-based 3D cards. One (the master card if you will) should be CrossFire-capable. CrossFire doesn't require a bridge as SLI does, and, instead, ATI opted to do things differently with a second chip (not on the VPU chip itself), dubbed the Compositing Engine system.

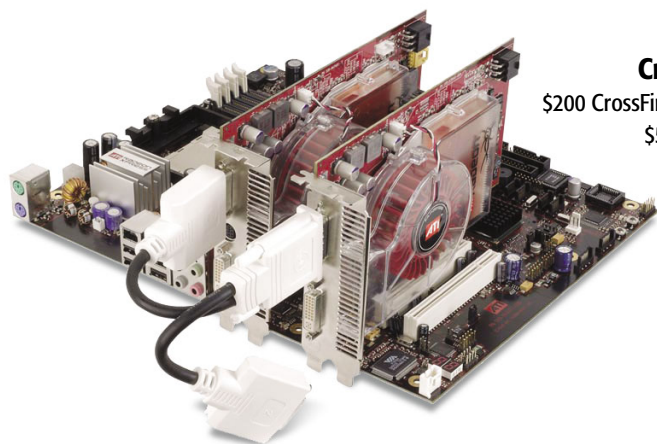
Using the compositing chip on the master card, it grabs the data from the master card and blends it with the secondary card, which receives the data digitally over a DVI cable from the secondary card's DVI output. The CrossFire card then outputs this composite image from its own DVI connector. There's an advantage to doubling up using this method because you don't need a secondary (daughter) card with the same speed or even the same BIOS as the primary CrossFire edition 3D card. This gives end users more options than SLI because you can pair the CrossFire X850 XT with either an X850 XT or an X850 Pro. And the Catalyst driver dynamically controls the synchronization of the cards.

Rendering Modes

CrossFire cards will work together in several ways when presenting final imagery. The AFR (alternate frame rendering) method is perhaps seen as the most desirable for this. Each card renders an entire frame (one for even frames, the other for odd) doing all of the necessary geometry and pixel processing separately. This method will be available in D3D (Direct3D) and OpenGL games and controlled via a selector in the driver's control panel.

Next up is scissor mode. In this mode the entire frame is horizontally split in half, so that one card is responsible for the top portion and the other the lower portion. Even though this split is not even, the ATI driver dynamically adjusts the level of this split (60/40 or 70/30) as workloads change. This mode will be the default CrossFire mode for OpenGL games.

The third and perhaps the most intriguing mode will be via supertiling. The entire screen is split up into 32 x 32 tiles and each GPU is allocated alternate checkerboard-style patterns on which the cards will perform their pixel processing. Employing this method actually takes out much of the needed guess work and load balancing required when working with dual video cards in one system. When working on pixels this close to each other in a scene, the likelihood of a more even split of workload is far greater than in any of the other methods. If this method is



CrossFire Technology

\$200 CrossFire motherboards; \$249 to

\$549 CrossFire video cards

ATI

(905) 882-2600

www.ati.com

Specs: AFR, SFR, and supertiling rendering modes; supersampling and higher AA modes

used, theoretically the levels of fill rate and pixel shader throughputs will be closer to a “real” 2X. This type of rendering method is apparently employed in super-high-end Vis/Sim applications by companies such as Evans & Sutherland and will be the default option in D3D mode; however, it doesn’t work in OpenGL mode. Another caveat is that the vertex processing load won’t be shared and, instead, duplicated on each card, so there won’t be any real performance gains in that department.

Sample This

Another feature that CrossFire will bring to the table is Super AA (antialiasing), which will come in handy for older games that are less stressful on today’s high-powered GPUs and where fill rate/geometry aren’t really a problem with a single card. What this means is that you’ll get some boost to image quality in terms of improved and higher-quality AA modes. The CrossFire’s compositing chip will be employed to combine images from both cards but with different sample points in 4X or 6X, which means you’ll get 8X or 12X, respectively. The multisampling AA

method can only take you so far as alpha blended textures remain aliased and jaggy-looking; hence, ATI has added supersampling AA as an option with CrossFire. Traditionally, though, this method has a much larger performance penalty, even if it does produce more pleasing results. Nevertheless, with two X850’s working together, that won’t be an issue. Also, a new 10X AA mode will be available, which is a combination of 8X multisampling AA and 2X supersampling AA. A 14X AA mode also will be offered in the same fashion with 12X MSAA and 2X SSAA.

CrossFire motherboards and video cards will be available from ASUS, MSI, GIGABYTE, etc. by July or August. Timing is critical because the past few releases from ATI were plagued by delays. NVIDIA already has a six-month head start with SLI. When CrossFire does arrive, and assuming that it not only arrives but that its performance is at least close to or on par with NVIDIA’s SLI, then the greater number of rendering options for games looks fairly tasty. Being able to pick and chose which multi-GPU mode you want for a particular game is the kind of thing power

users lap up. There will be three CrossFire Edition cards to choose from: the Radeon X850 256MB at \$549, which will work with the X850XT PE, X850 XT, or X850 Pro; the X800 256MB priced at \$299; and the X800 128MB priced at \$249. (Both the X800 256MB and 128MB will work with an X800 XT PE, X800 XT, X800 XL X800 Pro, or an X800.) Although I don’t have hardware yet to validate any type of recommendation; the only benchmark numbers I was shown were in-house, where Splinter Cell saw close to a 100% gain and Return To Castle Wolfenstein saw 70% gains.

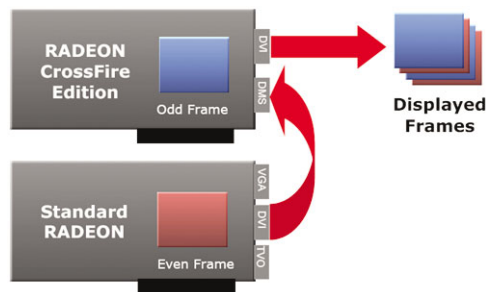
Worth It?

So buying a new chipset and shelling out for a couple of ATI cards isn’t exactly going to be cheap, now is it? But then again, if you already own an X800 or X850 series GPU, the option to team it up with a CrossFire-enabled card sure is enticing. We could all use better performance at 1,600 x 1,200 with 4XAA and 8XAF, couldn’t we? ▲

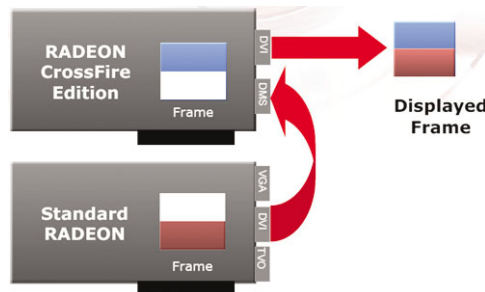
by Alex “Sharky” Ross

CrossFire Technology: Visuals

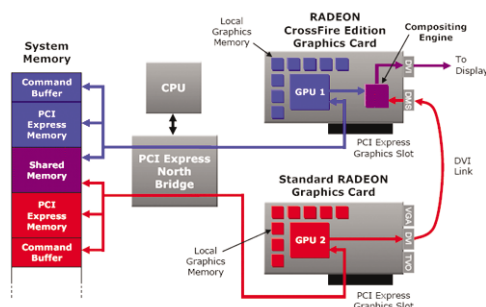
AFR Mode



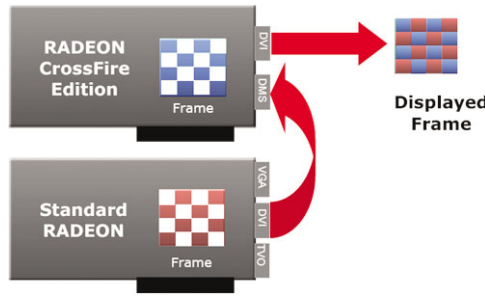
Scissor Mode



Working Memory



Supertiling Mode

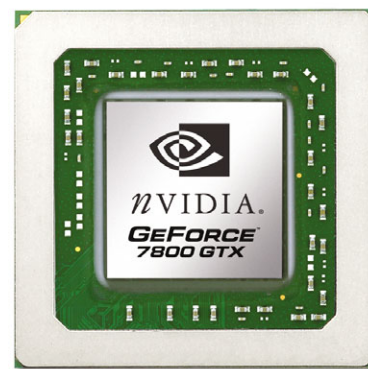


Specs: 302 million transistors, CineFX 4.0, 24 pixel shaders, 8 vertex shaders

Just before going to press I was invited to a briefing and demo on NVIDIA's next-gen G70 GPU. The new high-end board will be released as the GeForce 7800 GTX with 600MHz 256MB of 256-bit DDR3 memory. It won't be completely revolutionary in terms of technology, but what the board will do is take DX9 performance (in particular Pixel Shader 3.0 games) by the scruff of the neck. NVIDIA likes to think of it as a "shading monster" thanks to its new-found shader arithmetic density. Apparently NVIDIA analyzed over 1,300 shaders to get there. Compared to the previous generation, with the CineFX 4.0 engine, there's over 200GFLOPS worth of shading on tap. That's two times the floating-point shader power previously available. Another push will be for improved HDR performance in both fp16 and fp32 as the new texture core accelerates 64-bit floating-point texture filtering for crisper visuals

(texture bandwidth is 44.4GBps). And yes, it will be SLI-capable. Furthermore, the chip itself is a massive 302 million transistors and will be clocked at 430MHz.

NVIDIA's taking what it's learned from the previous Shader Model 3.0 6800 series, saddling up on the parallelism bandwagon, and gentrifying the efficiency just about everywhere (especially in terms of shading). But are we reaching the limits in games in terms of geometry and shading? Hardly. There are plenty of PS3.0 games on the horizon, so we'll take the 24 pixel shader units and eight vertex shader units the 7800 GTX will offer. Whether it's for Unreal Engine 3-based games or Doom 3, there are still benefits in refined performance and efficiency in terms of math per pipeline and especially per clock. The architecture has improved scheduling and high-precision performance. Even the anisotropic filtering performance has been targeted (which was



already pretty darn good). As far as anti-aliasing goes, modes up to 16X will now be supported using a combination of both multisampling and supersampling techniques with SLI enabled in the drivers. Also, there will be many more SLI profile games on offer than before but easier wizards to create your own this time around.

The board will be quieter than its predecessor and suck less power, all in a single-slot solution. NVIDIA says it'll have 2.7 times the performance per watt, and the new HSF combo looks snazzy. It covers all eight pieces of 8Mx32 and the chip itself.

It seems NVIDIA is listening to users about its lack of presence in comparison to ATI's All-In-Wonder feature set. The 7800 GTX will sport PureVideo technology and include a real dedicated video processor. With integrated HDTV outputs, HDCP support, high definition H.264 acceleration, HD de-interlacing support (1080i), and inverse 3:2 and even 2:2 pull-down.

The 7800 GTX's going to be *very* fast. The demonstrations I was given and early prediction/benchmarks were certainly out there. In many cases 50% to 70% faster. All good things must come to an end, though, and we're off to benchmark for the next coming issue, so stay tuned. The official release date is June 21, so cards should be available when you read this. ▲

by Alex "Sharky" Ross



GeForce 7800 GTX

\$599

NVIDIA

(408) 486-2000

www.nvidia.com



CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

DEMONIC POSSESSION

de • mon • ic (dī-mŏn'īk) pos • ses • sion (pə-zēsh'ən)



BEING COMPLETELY
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passion OR THE
SUPERNATURAL



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THING OR IDEA AT
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ALL ELSE



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spiritual FORCE
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THE STATE OF A
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Hitachi Deskstar 7K500 SATA 3Gbps HDD

For all intents and purposes, the 7K500 is a monumental release (half of a terabyte, 3Gbps, NCQ, 16MB of data cache, and staggered spin-up in a 500GB offering). It represents all of the latest developments to the SATA specification. To be fair, they don't all make a tremendous impact on desktop use, but the cumulative effect is full utilization of Intel's ICH 7 controller hub, NVIDIA's nForce4 chipset, Promise Technology's TX300, and Silicon Image's 3124 add-in controller.

The 7K500 can actually run in either 1.5Gbps or 3Gbps mode. Most of the performance numbers are similar going from one to the other. However, burst transfer rates jump substantially with the 3Gbps ceiling. PCMark04's hard

drive test suite echoes that improvement. Surprisingly, the drive accomplishes great benchmark numbers while generating very little noise. Next to Seagate's 400GB 7200.8, it's completely inaudible.

You can expect to pay for the privilege of owning one of these 7K500 drives. Though not readily available quite yet, expect the SATA model to run more than \$500. For that price, you could buy four 250GB Western Digital Caviar SE drives, yielding a full terabyte of space. Although there's a palpable performance gain to be had in data bursting, on average, the 7K500 won't buy you much speed.



Deskstar 7K500

\$520

Hitachi

(800) 801-4618

www.hitachigst.com



Its true calling is in the SMB space, where staggered spin-up and 3Gbps compatibility lend themselves to use with port multipliers and massive hard drive arrays. Used as an alternative to SCSI and complemented by SAS hardware for the mission-critical data, Hitachi's Deskstar 7K500 is actually a solid value proposition. ▲

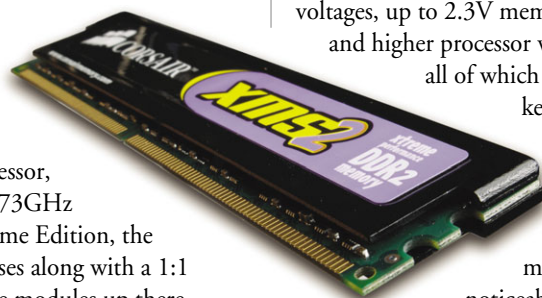
by Chris Angelini

Specs: 7,200rpm, SATA 3Gbps, NCQ support, 16MB of data cache, 500GB capacity, staggered spin-up support, SMART support

	Hitachi 7K500 3Gbps	Hitachi 7K500 1.5Gbps	Seagate 7200.8 400GB
HDTach			
Average Read	51.1MBps	51.1MBps	59.1MBps
Burst Speed	228.5MBps	133.3MBps	137.2MBps
Random Access	12.7ms	12.7ms	16.1ms
PCMark04 HDD Suite	6317	4309	Fail

Corsair XMS2 8000 DDR2 Memory Kit

Corsair is enabling the old-time synchronous operation for Intel platforms with its TWIN2X-8000UL kit, designed to hit 1GHz memory speeds, albeit at higher latencies. Paired up with a 1,066MHz processor, such as Intel's 3.73GHz Pentium 4 Extreme Edition, the 8000UL kit cruises along with a 1:1 ratio. Getting the modules up there requires special voltages, of course, but stability with the right motherboard is remarkably solid. For now, ASUS'



P5WD2 Deluxe is the only specimen to come highly recommended. The board's BIOS facilitates higher memory controller voltages, up to 2.3V memory settings, and higher processor voltage options, all of which are needed to keep everything stable.

Despite the 5-4-4-9 timings, performance improves noticeably at 1GHz vs. a DDR2-533 kit running CAS 3 settings, as evidenced by SiSoft Sandra 2005 and running Doom 3 at 1,024 x

TWIN2X1024-8000UL 1GB Kit

\$300

Corsair

(510) 657-8747

www.corsair.com



768 using Ultra quality settings. In this case, the raw frequency more than compensates for the latency compromise.

The TWIN2X1024-8000UL kit is fairly pricey at \$300. However, if you're already buying an Extreme Edition processor for its 1,066MHz FSB, the \$300 tag might not seem too steep. Corsair sweetens the deal by actually qualifying the modules at 2.2V and guaranteeing them for life. The result is lightning-fast, extremely stable, and well-protected from failure, even at a nonstandard voltage. If overclocking is your bag, the 8000ULs will really allow you to play. ▲

by Chris Angelini

The Digits

	1GHz Memory Bus	533MHz Memory Bus
	CAS 5-4-4-9	CAS 3-3-3-8
Sandra 2005 RAM Bandwidth Int.	6682	6410
Sandra 2005 RAM Bandwidth Float	6697	6397
Doom 3 1,024 x 768 Ultra Quality	89.6	88.3

Specs: 1,000MHz performance, 1GB kit (2 512MB), 2.2V, lifetime warranty, 5-4-4-9 SPD latency settings

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Shuttle SB83G5M Media Center SFF

The SB83G5M represents the company's most conscious effort to break into your living room with a media center box. It's designed to work with Microsoft Windows XP Media Center Edition 2005, after all.

From the outside Shuttle maintains the sharp aesthetics that have held competing SFF manufacturers at bay. The front panel boasts a stealth optical drive cover and two drop-down doors that hide I/O and a 3.5-inch device. Below the status LEDs and power button is a VFD that displays fan speeds, temperatures, and media information when you use it



in conjunction with MCE 2005. Naturally, a sleek mirror-finish coats all of the front panel components.

The internals are what make Shuttle's SB83G5M so appealing, though. Start with Intel's 915G chipset, which supports Pentium 4 processors (but not the new Pentium D) on an LGA 775 interface. The logic features an integrated graphics controller for those who don't need ATI All-In-Wonder functionality, along with a x16 slot for those who do. A new ICE (Integrated Cooling Engine) design is mated to a 92mm exhaust fan for efficient cooling without creating a lot of noise.

Specs: Intel 915G chipset, LGA 775 interface, 2 184-pin DDR400 memory up to 2GB, 6-channel audio output, integrated GMA 900 graphics, 1 PCI-E x16 slot, 1 PCI slot, Gigabit Ethernet, VFD display, 250W power supply

SB83G5M Media Center SFF

\$290

Shuttle

(626) 820-9000

www.shuttle.com



In order to employ the VFD display, you'll need to use Shuttle's XPC Tools software package, which wasn't included in the barebones kit and appears to be in beta. Nevertheless, the software is stable, and it facilitates a number of different display settings, including a custom message.

Shuttle's SB83G5M could use built-in wireless to round out the media center appeal. It'd also be well served by a beefier power supply to support faster graphics cards. But overall, the 915G-based kit is attractive, fast, and quiet—three qualities that earn it a spot in my own theater room. ▲

by Chris Angelini

AMD Athlon 64 X2 4800+

If 2004 was the year to find out the limitations of clock speeds, then 2005 is the year of parallelism, dualism, multi-GPU, and multicore; and I'm loving every minute of it. Just before closing last month, I was able to sample AMD's dual-core Athlon 64 X2 4800+. After spending a full month testing, playing, and enjoying my experience, I'm here to give this CPU a rubber stamp of approval. Not only were my early performance numbers correct, but AMD's promise of a "simple" BIOS update in order to work with existing 939-based motherboards proved to be correct. The X2 was rock solid on multiple motherboards. Sporting 1,024KB worth of L2 cache and a 2.4GHz clock speed, the Toledo core is based upon AMD's 90nm SOI process; and despite the core's rather large size, it barely draws more power than a single FX-55 processor. Another neat factor is that if 2.4GHz isn't enough for you, take into account

that I was able to overclock this particular X2 up to 2.64GHz.

The benchmarks showed how capable this CPU really is (see the benchmark numbers in the July issue of *CPU*, on page 16), not to mention how far ahead AMD is in front of Intel these days. The CPU performs remarkably well. In almost all cases it ends up on top of the pile, no matter what type of scenario you throw at it, whether that be single-threaded or multithreaded or multitasking. Despite its 200MHz less clock speed over the previous FX-55 champ, it makes up for this in many ways, making this the most desirable (but not most affordable) CPU to date. There is so much untapped talent yet to be realized in terms of 64-bit computing, SSE3, and even "better" multi-threaded application support (and yes games too). Better yet, it's actually available both for DIYers and from system integrators such as Alienware. It fetches a

Athlon 64 X2 4800+

\$1,001

AMD

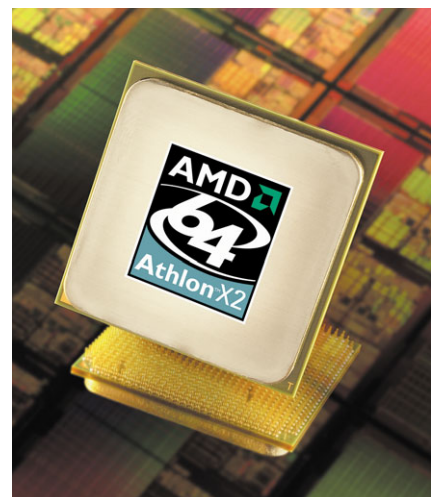
(951) 674-4661

www.amd.com



pretty penny though, at about \$1,000 in quantities per 1,000. ▲

by Alex "Sharky" Ross



Specs: 2.4GHz, 90nm, Toledo core, 2X 1,024KB L2 cache

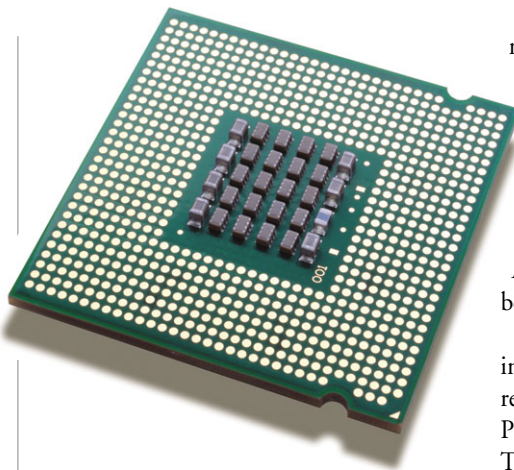
CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Intel Pentium D 800 Series

Processors have evolved for years now under the pretext that clock speed and IPC were the two keys to boosting performance. Intel elongated the pipeline of its Pentium 4 and went for frequency, while AMD proved with K8 that IPC is an equally potent variable. But now there's a third puzzle piece affecting the bottom line of computing superiority: parallelism. Just like multiple pixel pipelines operate in concert to accelerate 3D rendering, so too can processing cores cooperatively hash through a properly optimized application. That's precisely the idea behind Intel's Pentium D processor. It has the same 31-stage execution pipeline as today's Pentium 4 and sacrifices several hundred megahertz. But the Pentium D features two complete Prescott cores, each with 1MB of L2 cache, enabling it to address a pair of threads at a time.

Before you ask, yes, that's what Hyper-Threading is meant for; however, dual-core does the job with physical resources instead of a logical design. Efficiency is naturally much improved. In fact, the difference is significant enough to overcome the lost megahertz in many cases. On the other hand, when an application isn't specifically written to harness the virtues of multi-threading, the second core basically sits idle, providing no benefit at all. This is the case with many existing programs, though Intel is committed to helping developers make better use of available processing power.

Fortunately, the Pentium D still has enough horsepower to make it a viable contender even when it isn't being fully utilized. Manufactured on a 90nm



Pentium D 800 series

840: \$530; 830: \$316; 820: \$241

Intel

(408) 765-8080

www.intel.com

840:



830:



820:



process, Intel's able to pack on all of its value-added goodies such as EM64T, Enhanced SpeedStep Technology, and the Execute Disable virus protection bit. Note that Hyper-Threading actually isn't included. The \$1,000 Pentium Extreme Edition 840 at 3.2GHz is the only dual-core offering with Hyper-Threading, giving it the ability to plow through four threads at a time.

Intel's Pentium D is initially available in three clock speed flavors: 3.2GHz, 3GHz, and 2.8GHz. Despite its flagship stature, the 3.2GHz Pentium D 840 sells for a

reasonable \$530. The Pentium D 830 (3GHz) goes for \$316, while the 820 costs just \$241. Complex as the Pentium D might be, Intel seems focused on pushing it into the mainstream with consumer-level prices. And faced with intense competition from AMD, attractive pricing seems to be the best strategy for wooing interested buyers.

The only problem is that performance in today's single-threaded applications is relatively lackluster given the 3.8GHz Pentium 4s and competing Athlon 64s. Threaded alacrity is much better, though still behind the admittedly pricier Athlon 64 X2. You won't see tremendous variance between the three Pentium D models in nonthreaded titles, as our game benchmarks indicate, but video encoding with Dr. DivX is able to flesh out solid benefits each step up the hierarchy.

Platform support further muddies the waters. Whereas AMD's Athlon 64 X2 runs on any Socket 939 motherboard, the Pentium D requires an entirely new family of chipsets. So you'll save money on the processor itself, but do-it-yourselfers will need a motherboard upgrade. According to Intel the move is intended to promote its platform message with faster DDR2 memory, improved I/O performance, and a remote management component. To an extent the 955X and 945-series chipsets really are a step above their predecessors. But the more likely explanation is that last generation's core logic wasn't technically capable of accommodating a high-powered dual-core chip.

As an inexpensive way for video enthusiasts and content creators to get into dual-core processing, the Pentium D is a winner. But it shouldn't be your first choice for gaming. Moreover, if you have the money, AMD's Athlon 64 X2 will serve you better threaded and nonthreaded performance. Intel hopes to change that as it designs the 65nm desktop incarnation with a pair of 2MB L2 cache, set for release in 2006. ▲

The Numbers*

Dr. DivX (min:sec)	13:27	13:22	14:09	15:08
WinRAR (min:sec)	4:59	5:02	4:44	5:22

Half-Life 2

800 x 600 no AA/AF	71.05	72.49	69.43	65.78
1,280 x 1,024 no AA/AF	71.21	73.02	69.26	65.99
1,600 x 1,200 4XAA/8XAF	68.76	69.45	67.35	65.02

*Bonus benchmarks numbers available online.

Specs: Dual core, 2 1MB L2 cache, LGA 775 interface, 800MHz FSB, EM64T, Enhanced Intel SpeedStep Technology, Execute Disable, 90nm manufacturing, 206mm², 230 million transistors

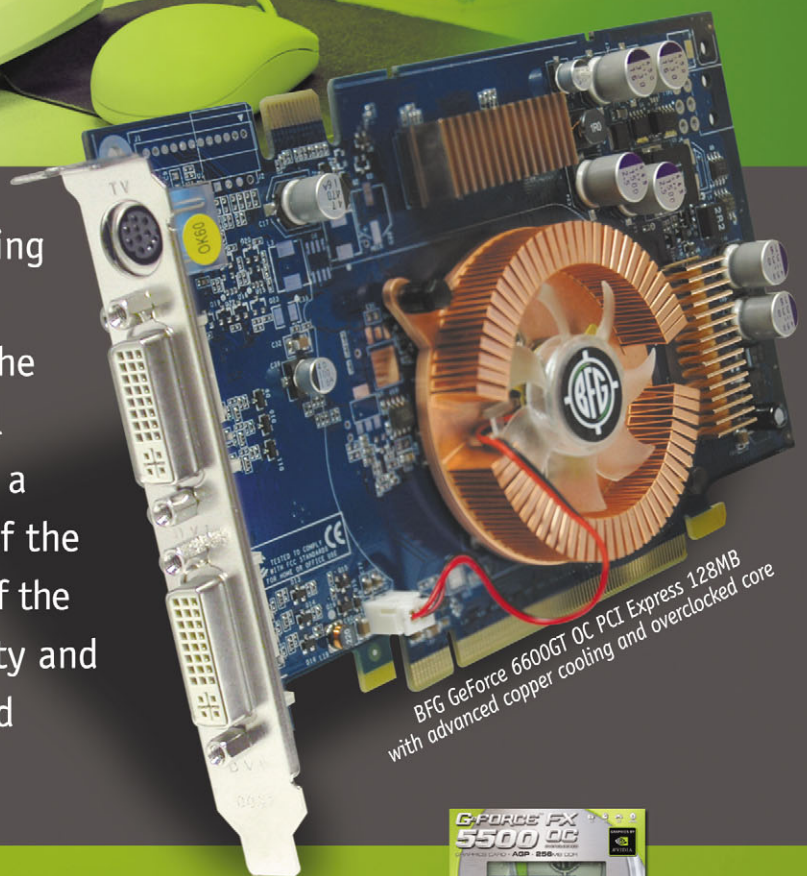
by Chris Angelini

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

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Multithreaded Gaming On Next-Gen Consoles

(The Real Story)

With the release of the first dual-core CPUs from AMD and Intel, the PC industry faced a major challenge: the quick adoption and development of multithreaded applications for dual-core microprocessors. The server and workstation folks welcomed the first dual-core CPUs; it meant that they could get twice as many cores in the same number of sockets that they were used to purchasing—the software already took advantage of it and performance scaled quite well. The desktop market, however, has been stuck in a very single-threaded environment ever since its inception. PC games were no different; aside from Quake III Arena's `r_smp` variable that would enable multiprocessor support, PC games are not at a stage to take advantage of dual-core processors.

Intel, in particular, would love to accelerate the development of multithreaded games for the PC, but it realistically won't have anything to show until late 2006 when the first major multithreaded PC titles are scheduled to ship. Looking at the Xbox 360 and PlayStation 3 being able to execute six and nine threads, respectively—is the console market immune to the issues surrounding slow development of multithreaded game engines? I've spent the past couple of months pondering the next-gen consoles and how development for them would differ from what we've seen on the PC, and for the most part, it looks like it won't.

According to Microsoft, the first generation of Xbox 360 titles are only using a single execution thread for the game engine itself, including all physics, AI, scripting, etc. Some developers have split off physics (collision detection) into a separate thread, which brings the total threads consumed up to a whopping two out of the Xbox 360's maximum of six concurrent threads. I've heard similar numbers for PS3 titles, although the latter are obviously much earlier in development stages. But with titles using only one or two threads of execution, they essentially leave the vast majority of the console's CPU power untouched.

Instead, what will happen is that developers will spawn other helper threads to handle

things like six-channel audio encoding (which Microsoft did in a separate DSP in the original Xbox), real-time decompression of content, and video decoding among other tasks. Take the Xbox 360, for example; the games on the 360 will continue to use 9GB DVD discs, offering the same storage space for the 360's games as the original console offered four years earlier. Obviously, games made for the 360 will need a bit more space than those made for the original Xbox back in 2001, and the system is much more powerful, as well. The result is that developers will be able to use some of the Xbox 360's execution hardware to perform real-time decompression on game data, much like unzipping files you need right before execution, in order to maximize space. The unzipping process will be executed in a separate thread, made possible by the Xbox 360's support for up to six hardware execution threads. Another example would be video decoding; game developers will be able to decode much higher quality video and audio in-game, and that decoding process will, of course, be run in a separate thread from the game code.

So from the looks of it, the titles that debut on the Xbox 360 this fall will be just as single-threaded as what we've got on the PC. It is in the future titles that there is hope for more fine-grained multithreading, and those titles will most likely make their way into the 360's library closer to when the PC gets similarly multithreaded games.

This also means that you shouldn't expect too much from the very first launch titles on the next-generation consoles in the way of having incredible physics or AI simulation thanks to their highly multithreaded architectures. Instead, the biggest draw this fall and when the PS3 launches next year will be the ability to have high-resolution graphics and much more detailed graphics thanks to some very powerful GPUs, on a console, hooked up to your TV. Other than the display medium and the differences in inputs, the 360 will be quite PC-like this fall. ▲



Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, CBS' 48 Hours, and Fortune. His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.

... the first generation of Xbox 360 titles are only using a single execution thread for the game engine itself, including all physics, AI, scripting ...

Talk back to Anand@cpumag.com.

Xbox 360: Here We Go Again

The console vs. PC gaming argument has been beaten harder than a drunken Glasgow Rangers football fan caught in his derby-winning team's colors in an all-Glasgow Celtic pub in Scotland. I'm not going to take a stab at the debate, but as a PC gamer for many years (I'm old enough to remember the first CD game *Rebel Assault*), I was impressed when the Xbox was first announced. I finagled my way to get an early unit and played *Halo* 'till the cows came home, or at least 'till the covenant buggered off. But to be honest, give or take a couple of neat racing games and perhaps a shooter or two, I've let the thing collect dust. Same thing happened with my SNES (back in the Amiga days), Nintendo 64 (*Golden Eye*), Sega Dreamcast (a very short affair was that), and PlayStation 2 (OK, so I played some *Gran Turismo 4* recently). The PC is where I lay my hat, or at least my mousepad. So what about this Xbox 360 thingamajig?

By now you probably have heard the rumors, possibly seen the pictures, and may be even have TiVo'd the MTV Xbox 360 launch special. Can't say I was impressed with the TV part (as very little technical information was given out), but with E3 come and gone, a lot more sauce was poured. Most exciting is that the guts (aka GPU) will no longer be in NVIDIA's court, as that's gone with Sony's PS3. Now it's ATI's turn to play ball with Microsoft, and it's doing so with a new strategy. Its 500MHz next-gen graphics chip could break new ground by employing unified shader arrays. The chip does not rely on separate pixel and vertex shaders but instead makes full use of 48 parallel shaders that can perform mathematical duties on data for both pixels and vertices, with the GPU dynamically controlling the load/balance of these shaders for pixel and vertex operations. Even though we won't be able to "dyno test" this GPU's horsepower (not like there has ever been any need for console game benchmarks), all this capability apparently equates to 500 million triangles per second, 16 gigasamples per second fill rate using 4X MSAA, and 48

billion shader operations per second. It does more than just graphics duties, as it also acts somewhat like a northbridge by being the system's memory controller with 512MB of GDDR3 memory onboard running at 700MHz accessible via a 128-bit interface. The bandwidth is a plentiful 25GBps between CPU and GPU. But wait, there's more memory, in fact, 10MB more of embedded RAM on-die specifically to tackle antialiasing (a dedicated AA buffer if you will). Visually the demos were A-OK but not shown in 16:9, 720p, or 1,080i with antialiasing, although that's where Microsoft is aiming.

The unit itself looks much sexier than the original Xbox, after all this is Microsoft's second go at it. At first glance, either upright or sideways, it's much akin to a pearl white version of a PS2 but with some Apple-inspired rounded curvy bits and a rather clunky, but nonetheless, wireless controller. OK so far on the surface, but inside it's got some kick to it and seems much less of a "stripped-down PC with a good 3D card in it" product that the original Xbox really was. Using a 3.2GHz IBM processor with three symmetrical running cores (yum) being able to run two hardware threads per core, clearly math capabilities won't be an issue (said to be 9 billion dot product operations per second). The processor will also have 1MB of L2 cache on tap. There will be wireless 802.11a/b/g connectivity, USB ports, a dual-layer DVD drive, and a removable 20GB hard drive.

I'm not exactly going to fall into the age-old trap of believing the hype then pronouncing that gaming on the PC is on its way out. Been there done that, bought the Xbox and everything that came before it, but still happily playing *Doom 3: Resurrection Of Evil* on the PC with twin GeForce 6800 Ultras in SLI mode. As long as PCs continue to be so easily upgradeable, DIYers like us will continue to serve as the earliest adopters of spiffy new CPU, GPU, platform, and memory technology. Oh, and if I'm wrong, I promise to repeat 100 times in my best Jar Jar Binks accent, "I accept me position with mui mui humility." ▲



Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently over-clocks/tunes Porsche 996 Turbos with www.akkuratpgi.com when he's not tweaking PCs.

The PC is
where I lay
my hat, or at
least my
mousepad.

Send me your favorite CD-ROM games from 1995 to sharky@cpumag.com

Computex 2005

If you are not familiar with Computex, it is a huge buyers' tradeshow that happens every June in Taipei, Taiwan. The defining factor that makes Computex unique is that it tightly focuses on computer hardware and peripherals. Unlike CeBIT in Germany and the Consumer Electronics Show in Las Vegas, Computex forgoes most of the computer software and personal electronics arenas. What this means that you will find booth after booth full of hundreds of mice and computer chassis that can best be described as generic commodities that are separated by little more than a different logo on a case badge.

On the other side of things, you will also find new products that have yet to make it market, with some of the more exotic among them very likely never to make it to a retail shelf near you. Although that may not seem like an "upside" to some of you, it surely makes for a coolness factor that you won't find elsewhere.

Probably tops on my list of cool Computex finds this year were both from Micro-Star International, also known as MSI. The first find was a dual GPU video card sporting tandem GeForce 6800 Ultra GPUs. Although most of this huge video card is covered by a heat-dissipation system utilizing six heatpipes that span both sides of the card, the real "nifty" feature of the card remains unseen. MSI has placed a whopping 1GB of RAM on this single-slot SLI monstrosity. Although it is highly likely you will never see this product on retail shelves, plenty of show goers took the time to give it a look, and most of them were wowed by its specifications. Not to be left out were ASUS and GIGABYTE. Both companies had models of dual GPU 6800 video cards on display, but no solid information on retail availability was being confirmed.

Another card at the MSI booth was based on ATI's X850 GPU, and it was very interesting, as well. On the "top" of the card was a PCI Express slot connector and on the "bottom" of the card was a more familiar AGP slot connector. The backplane connector floated on two sets of wires to the DVI connectors sleeved with a braided stainless

steel loom. Although I'm not fully sure of the target market for this thing, this configuration could certainly fill the needs of system integrators who are building computers with both AGP and PCI Express interfaces, as well as allow retail users an upgrade path that might be a bit easier on the pocket book in the future.

Dual GPU video cards may have been all the rage at Computex, but Shuttle was still looking toward traditional SLI. One reason being because the dual video cards I saw were longer than most of the SFF computers that Shuttle makes. Still, Shuttle amazingly fit the power of NVIDIA SLI into a traditional SFF computer, via model number SN26P. If you think that beefy high-end video card cooling would restrict this from happening, you would be correct, at least in the sense of stock 6800 cooling that we are used to seeing. What Shuttle has done, though, is fashion a custom heatpipe cooling system for the SLI video cards that is very much akin to its custom CPU cooling solutions that originally helped the SFF rise to its current popularity.

Although many a modder figured this out a long time ago, ABIT finally is bringing its AN8 SLI motherboard to market with a CMOS reset button built onto a new uGuru panel that fits into a drive bay on the front of your PC. No more opening the case to reset the CMOS. Certainly, this won't be a feature that all will use, but I'm sure many of us will appreciate it. And not to worry, in military specification fashion, ABIT has covered the CMOS reset button with a flip-up cover to prevent a misdirected finger from accidentally clearing it.

If you're a computer hardware junkie and you get the chance to make it to Computex in Taipei during the rather heated and muggy month of June, I highly suggest it. For those of you into hardware with a bit more power than even things like SLI, TYAN unveiled its eight-way AMD Opteron server, which will fit under most desks. There seems to be something at Computex for just about every hardware geek out there. ▲



Kyle Bennett is editor-in-chief of HardOCP.com one of the largest and most outspoken PC-enthusiast sites on the Web. HardOCP.com is geared toward users with a passion for PCs and those who want to get cutting-edge performance from their systems. Beware, though, Kyle is known for his strong opinions and stating them in a no-nonsense manner while delivering some of the most in-depth reviews and PC hardware news on the Net.

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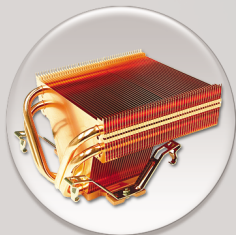
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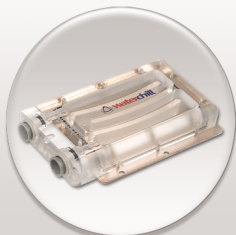
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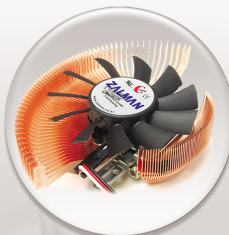
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Zalman VF700-Cu
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PC Modder

Tips & Tutorials

Modding does the body good. A PC's body anyway, inside and out. Here you'll find hardware, firmware, tools, tips, and tutorials for modding your rig's performance and appearance. Send us your own mod-related tips and ideas at modding@cpumag.com.

Modding enthusiasts have a penchant for the latest toys. Fast processors, powerful video cards, silent SFF enclosures, and radically lit motherboards are all fair game when it comes to a modder's creative mind. Recognizing the appeal of unconventional customization, an entire industry has emerged to support the community.

Mods & Ends

Logisys 20IN1 Multi Function Pane

Memory card readers are becoming increasingly popular as digicams, PDAs, and music players enter more households. But maintaining USB cables is a pain. Rather than buy one device that just reads CompactFlash, Microdrives, and Memory Stick/Pro, check out Logisys' 20IN1 Multi Function Panel (\$37), which combines plenty of I/O with a fan controller.

USB 2.0 powers the panel's card reader feature for speeds up to 480Mbps from card to card or to a hard drive. Because the four slots operate concurrently, you can connect several cards at a time and transfer data between them. The panel will recognize CF Type I/II, Microdrive, Memory Stick, SD, MMC, and SmartMedia cards.

A thermal sensor and fan controller unit link to an LCD screen, monitoring internal temps and facilitating fan fine-tuning between 1,000 and 9,900rpm. The display



Capable of 20 different functions, Logisys' panel packs more functionality into a 5.25-inch bay than any other device we've seen.

is just a blue backlit LCD output, but it is a useful feature for a chassis' front, especially in an overclocked environment.

Finally, an array of USB 2.0, FireWire, 1/8-inch audio jacks, composite video output, and Serial ATA round out the panel's copious connectivity. Logisys even includes all the cables you'll need to get everything attached to your motherboard.

Lian-Li PC-V800

Didn't desktop cases disappear along with Packard Bell and 15-inch CRT displays? Apparently not. Lian-Li's PC-V800 (\$150) doesn't set out for super-slim fitment or ultra-quiet operation. Rather, it introduces completely aluminum construction, a screen-door front fascia, and plenty of expansion room. It's perfect for a home theater PC, where the industrial aesthetics won't clash with other entertainment center components.

Many desktop cases are limited to smaller motherboards, due to horizontal space constraints. Not so with the Lian-Li PC-V800. Add a mini-ATX, micro-ATX, or full-sized ATX motherboard without running into problems. Extended ATX boards and BTX boards won't fit, unfortunately.

If the chassis whets your aesthetic appetite, small touches, such as a covered floppy drive bay and stealth optical drive bays, will further impress you. Front-panel I/O and strategic cooling vents contribute function to the stylish form. The only possible limitation would be room for a maximum of two hard drives.

Sunbeam Overclocker's Cool Kit

Sometimes it's the simplest idea that produces the best results. Sunbeam's Overclocker's Cool Kit (\$15) is a basic package

with a Mylar air duct, three fan connectors, a filter, clamps, screws, and washers. The idea is that you affix one end of the kit to a 70mm or 80mm processor fan and the other end to an outward-facing chassis exhaust port. Instead of sucking in air from inside the case, which is generally already hot, the kit pulls cool air from outside.

Sunbeam's charts indicate that, under full load, the Cool Kit can reduce processor temperatures by up to 15 degrees Celsius. Not bad for what essentially looks like a clothes dryer coil. Just be aware that the included brackets will not fit over Intel's rectangular reference assembly. The kit is designed for 70mm and 80mm square fans.



The Sunbeam Overclocker's Cool Kit can drop processor temperatures by up to 15 degrees.

Fashionably Fresh Firmware

Plextor PX-716A/PX-716SA/PX-716UF v.1.07

This firmware improves write performance on CD-R discs and improves the read compatibility of dual-layer discs.

www.plextor.com

Dell DJ (Gen. 2) v.2.11.04

Dell adds PlayForSure functionality to the DJ, complete with content management. Other fixes avoid lock-ups.

www.dell.com

Pioneer DVR-A09XL .1.40

This DVD burner picks up more speed with certain brands of DVD media (including DVD+DL, DVD+R, and DVD-R). It also improves reliability of DAO discs.

www.pioneerelectronics.com

D-Link DGL-4300 v.1.3

This latest firmware includes increased wireless security, more options for access control, new features, and some bug fixes.

www.dlink.com

by Chris Angelini

“Silent But Deadly”

The Secret To Cooling Is In The Air, Part I

In the perpetual quest for higher performance, many power users and hardcore PC enthusiasts equip their systems with a multitude of fans in an effort to help lower operating temperatures. With cooler temperatures comes greater stability and the potential for higher overlocks—two things enthusiasts universally crave. However, there is a negative side effect to having numerous case fans installed in a system.

In a typical high-end, air-cooled rig, there is usually a minimum of seven fans spinning at any given time, including two case fans; two power supply fans; and one fan each for the CPU, GPU, and motherboard chipset. Add a blow-hole, a couple of side-mounted intake fans, and a fan for the hard drive cage, and that number can easily jump to more than 10. Although all these fans spinning in a system lower temperatures, the cumulative effect is excessive noise. Each fan creates vibrations and turbulence, which in turn creates unwanted noise. And fans aren't the only parts in the system generating noise. Any component with moving parts, including hard drives and optical drives, will generate at least some audible sound.

So, what do you do if the noise gets to be too much? Is it possible to build a high-performance rig that doesn't sound like a jet engine spinning up before take-off? Simply put, can you have your virtual cake and eat it, too? Our goal was to find out.

Today's Theme: Individual Attention

In December 2004's *CPU* (page 30), we explained some techniques to properly wire a system for cleanliness and optimal airflow. In that article we also

pointed out that the key to success was giving each and every wire some individual attention. You need to route, mount, fold, or alter in some way each wire and cable for the best possible performance. The same holds true in building a silent or nearly silent PC. You need to choose or modify each component with the same goal of performance in mind, and each component needs some individual attention.

We tried to keep a few things in mind when we began selecting the components for this build. First and foremost, of course, we wanted components that would be as quiet as possible. However, we also wanted parts that could either be passively cooled or would be a good complement to passively cooled components. This approach is exactly what we were thinking when it came to selecting our enclosure. We wanted a high-quality ATX tower case that would be easy to



Cooler Master's Centurion 5 CAC-T05-WW case is better suited to using some passively cooled internal components than most other ATX towers, due to its wire-mesh front bezel and large, 120mm, rear-mounted exhaust fan.

work with and was designed for maximum airflow with a minimal number of fans. Ultimately, we narrowed our choices to the Lian Li PC-V1000B and the Cooler Master Centurion 5 CAC-T05-WW.

Both cases feature either a perforated or wire-mesh front bezel that lets air flow through the case much easier. In addition, both feature 120mm exhaust fans, which is another plus. Larger fans can spin slower than smaller ones, yet still move the same amount of air. The ability to move more air at lower rotation speeds generally makes larger fans quieter, and, hence, the better choice for a silent-PC project. The Centurion 5 CAC-T05-WW was our choice in the end, thanks to its availability and affordable price, which was one-fourth the cost of the PC-V1000B.

The Centurion 5 didn't include a power supply, however, so we had to choose a good PSU for our rig, as well. In the past we have worked with Enermax's Noisetaker and ThermalTake's Silent PurePower line of power supplies. We've found these to be relatively quiet, reliable solutions. Both PSUs, however, have multiple fans, which was something that we wanted to avoid in this project. As mentioned earlier, fans generate noise, so we wanted to keep the number of fans in our PC at a minimum. After some searching for a quality but quiet power supply, we opted for another model from ThermalTake, the Silent PurePower W0029 ATX 350W.

The W0029 is a fanless solution with copper, thin-finned heatsinks protruding from either end. Two bonuses to this design are that the heatsinks, the hottest parts of the power supply, are



ThermalTake's Silent PurePower W0029 ATX 350W power supply isn't equipped with any fans, hence it generates no noise.

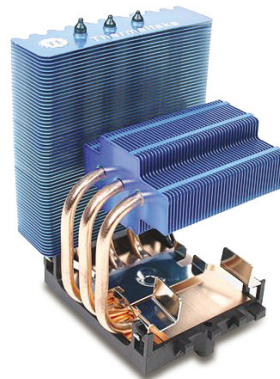
built outside the system, and because it has no fans, the PSU is completely silent. The W0029 ATX 350W PSU does require air to flow over the heat-sinks to prevent overheating, so don't plan on using this power supply if you are going to hide your system in a closet where the air is stagnant.

After selecting the enclosure and PSU, we focused our attention next on the CPU, CPU cooler, and motherboard—the heart of the system. Initially, we thought a good choice would be a water-cooled, low-end LGA775 Pentium 4 processor that we could easily overclock

and a motherboard that was completely passively cooled, such as the DFI LAN-Party 925X-T2. We changed our minds quickly, though, as the thought of cooling an overclocked Prescott CPU and adding a water pump and fans for a radiator didn't seem the best choice.

We then decided to put the money we would have spent toward a good watercooling kit toward a new Rev. E "Venice" core-based Athlon 64 processor. During some recent testing in our labs, we have found AMD's Rev. E Athlon 64 3800+ to run exceptionally cool. When using a stock cooler, even when overclocked to almost 2.6GHz, our Rev. E Athlon 64 3800+ never broke the 100-degree Fahrenheit (38-degree Celsius) mark, which makes it an ideal processor for a silent PC. And because the Rev. 3 3800+ doesn't require as much power as some competing high-end processors, it won't overburden our somewhat-modest 350-watt fanless power supply.

We decided to couple the processor with another ThermalTake product, the Fanless-103 CPU cooler. The Fanless-103 is a rather unique animal; it features a hefty copper base, heatpipes, and two high-density banks of thin, aluminum heatsink fins. Six heatpipes (three for



The ThermalTake Fanless-103 CPU cooler uses large aluminum fins and heatpipes to lower the processor's temperature. However, some air must still circulate over the Fanless-103's fins for optimal cooling performance.

each bank of fins) wisp heat away from the CPU and transfer it to the fins of the heatsink. Best of all, the Fanless-103 generates 0db of noise; it's completely silent because it has no moving parts. The Fanless-103, however, does need air to circulate over its fins to help prevent thermal saturation, but the 120mm case fan included with our Centurion 5 should be more than adequate. The Centurion will only be a couple of inches away from the Fanless-103 when we complete the build.

Choosing a motherboard was a no-brainer. We wanted a motherboard geared toward overclocking that also came with a quiet or nearly silent chipset cooler. DFI's LANParty NF4 SLI-DR fills the bill perfectly. The LANParty NF4 SLI-DR is equipped with large, aluminum heatsinks on all its MOSFETs, and the motherboard's nForce 4 SLI chipset is adorned with a magnetic levitation cooling fan with speed control. The aluminum heatsinks help keep the temperatures of the motherboard's hottest running parts in check, and the variable speed, magnetic levitation chipset cooling fan is almost completely silent. Only when the NF4 chipset gets excessively hot does the chipset fan spin at its maximum speed, which makes it a good complement to our silent PC. In addition, the DFI LANParty NF4 SLI-DR has decent eight-channel onboard sound and



AMD's new 90nm "Venice" core (Rev. E) Athlon 64 processors run cooler and consume less power than previous Athlon 64 revisions, making them a good choice for a silent PC project.

The Parts Of “Silent But Deadly”

We chose a series of commercially available parts to build our high-powered, silent PC. Only a minimal amount of modding was necessary to complete the build. Our goal was to construct a completely stable system that was as silent as possible without sacrificing much in terms of overall performance. The following are the parts we selected:

- **Case:** Cooler Master Centurion 5 CAC-T05-WW, \$55
- **CPU:** AMD Athlon 64 3800+ (Rev. E), \$370
- **Motherboard:** DFI LANParty NF4 SLI-DR, \$175
- **Memory:** Kingston HyperX KHX3200AK2/1G 1GB (2 x 512MB) PC 3200 Kit, \$155
- **Video card:** Sapphire Radeon X800 XL (PCI Express), \$280
- **Hard drive:** Seagate Barracuda 7200.7 ST380817AS 80GB, \$65
- **Optical drive:** NEC ND-3520A BK DVD Burner, \$45
- **Power supply:** ThermalTake Silent PurePower W0029 ATX 350W, \$125
- **CPU cooler:** ThermalTake Fanless-103, \$37
- **Hard drive cooler:** Zalman ZM-2HC2 NP, \$25
- **Fan controller:** Vantec NXP-205-BK fan controller panel, \$20
- **GPU cooler:** Arctic Cooling AVC-AT5 Rev. 2 72mm Ceramic VGA Cooler, \$33
- **Miscellaneous:** Rubber fan isolators, \$10; nylon wire ties, \$5
- **Total cost: \$1,400**

gigabit LAN capabilities built in, which eliminates the need to buy these parts separately and minimizes the number of expansion cards we would have to install in the system.

Graphics & Storage

With the foundation of our project in place, we needed to choose a video card

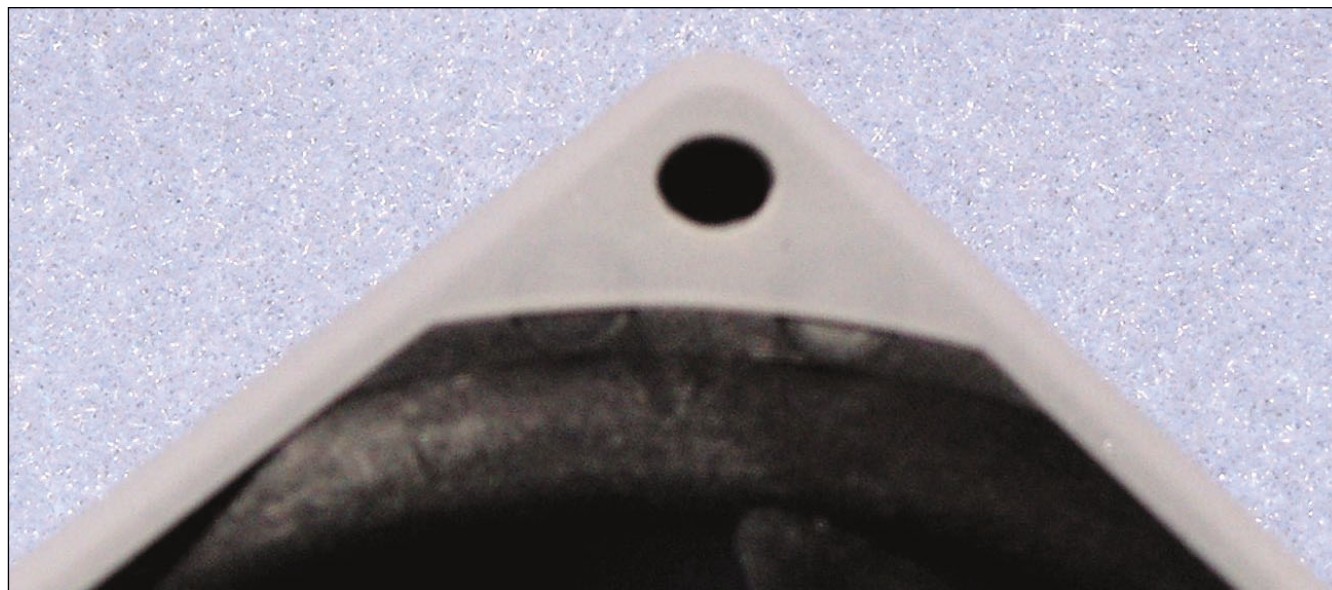
and drives for our “Silent But Deadly” PC. We want this rig to be an excellent gaming machine, so a high-end video card is a must. Unfortunately, high-end video cards have hefty power requirements and usually ship with coolers so loud they can make you cringe. GIGABYTE’s GV-RX80256D X800 Turbo Silent Pipe, which is passively



To quiet down our relatively noisy video card, we used an Arctic Cooling AVC-AT5 Rev. 2 72mm ceramic cooler. It isn't completely silent, but the AVC-AT5 is much quieter than the stock cooling you'll find on most video cards.

cooled, was a candidate, but it only had 12-pixel pipelines, which left us feeling a little flat. Instead, we chose a Sapphire Radeon X800XL.

At first glance this may seem to go against our silent theme because high-end video cards are hardly quiet. However, the stock cooler on our X800XL will never see the inside of our rig. We acquired an Arctic Cooling AVC-AT5 Rev. 2 72mm Ceramic cooler, which is far more effective than the stock cooler supplied with the X800XL and it is much quieter to boot. The X800XL is also the least power-hungry of all the 16-pipe video cards currently on the market,



We used rubber shrouds (seen here and the upper right of the next page) to help prevent our case fans from making direct contact with our system's case. This approach also helps prevent vibrations from transferring to the chassis, which creates unwanted noise.

evidenced by its lack of a supplemental power connector. A GeForce 6800 GT was also in the running, especially because our motherboard is based on the nForce 4 SLI chipset, but the card's more demanding power requirements and higher operating temperatures were not something that we wanted to contend with.

Choosing drives for our rig was probably the easiest consideration. Seagate's Barracuda line has included some of the quietest, high-performance hard drives available in the last few years. We opted for a 7,200rpm Barracuda 7200.7 ST-380817AS 80GB model with 8MB of cache. The main attractions of this drive are that it is relatively fast, it uses the SATA interface with NCQ, and it only has one platter. The less spinning platters there are in a drive, the fewer moving parts it has, which ultimately makes the drive quieter. Of course you can never have enough storage, and 80GB is hardly considered big by today's standards. However, silence was our main concern with this build; if we need more space in the future, we'll just throw in another drive.

We also chose an NEC ND-3520A BK DVD Burner for this project, simply because it's reliable and really inexpensive. When you insert a disc, the ND-3520A will likely be the loudest part of the system, but we decided to make due anyway. We don't foresee leaving any discs in the drive unless we're installing a game or burning data.



The Complementary Components

The last group of components we chose is designed to modify or complement the other parts of our "Silent But Deadly" rig that we've already detailed. Although Seagate's Barracuda drives are already quiet, we picked up a Zalman ZM-2HC2 NP (noise prevention) hard drive cooler, as well. The ZM-2HC2 NP isolates the hard drive from our case using rubber grommets to prevent noise from being introduced by the drive's vibrations. The ZM-2HC2 NP also

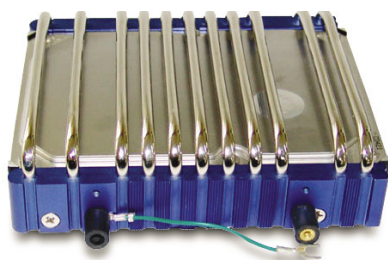
helps cool the drive through the use of aluminum heatsinks and heatpipes.

To ensure that the few fans (three, if you're keeping count) that we will use in this system will generate the least amount of noise possible, we purchased a set of rubber fan shrouds that prevent the fans from making direct contact with the metal in our case. We also got our hands on a Vantec NXP-205-BK fan controller, which will let us throttle our fans back to a lower speed to minimize noise.

To Be Continued

This concludes the first part of our "Silent But Deadly" PC project. Next month, we'll show you how the rig turned out. In addition, we'll detail the system's acoustic, thermal, and application performances. We'll also overclock the system's CPU and video card to see what kind of speeds we can attain with our stealthy, silent PC. Be sure to check in next month, as "Silent But Deadly" is whisper-quiet, fast, and quite a looker. You won't be disappointed with the finished product. **CPU**

by Marco Chiappetta



Zalman's ZM-2HC2 NP hard drive cooler serves two purposes: It isolates the drive using rubber grommets to minimize vibrations and pulls heat from the drive using heatpipes and heatsinks.



We used a Vantec NXP-205-BK fan controller to throttle the speed of the two case fans in our system build.



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Mad Reader **MOD**

ZEN FURNITURE WITH A PUNCH

Using software to plan your mod helps avoid design problems before you invest in the building materials. Jeff Kaiser spent about eight hours using SketchUp software before assembling the Lubic Zen-Feng.



A erocool's Lubic kits let modders build unique enclosures without investing in heavy-duty shop equipment. Most modders use the kits to build complicated rigs that resemble airplanes or trucks. Jeff "Dgephri" Kaiser built something different. After designing his system in @Last's SketchUp, he started his Lubic Zen-Feng (pronounced "Zen-Fong").

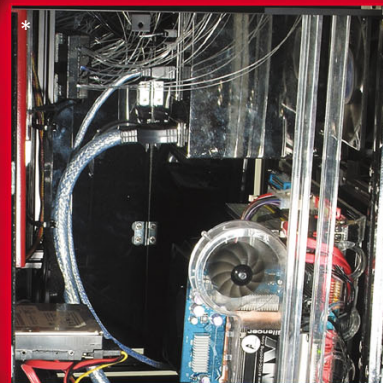
The rig breaks from the pack with its size, but Kaiser made it as complicated as other Lubic mods floating around the Web. The boxy Lubic Zen-Feng boasts what Kaiser refers to as the "Water Feature," a customized desk fountain that makes for a stunning display at the center of the computer. The bright-red box features a waterfall and emits a variety of soothing sounds.

Folding screen doors add to the theme. "All four sides open up in some way, providing nearly 360-degree access, except for

the vertical bars," Kaiser says. Kaiser built the doors by assembling and drilling plastic strips and attaching white paper. The doors aren't the only accessibility feature. Instead of a sliding motherboard tray, the tray swings out of the system (the back panel swings up first, then the tray swings down).

Another unusual feature is an attached monitor, which swings toward the case's side to reduce the rig's footprint. "I knew the case was going to be big, and LAN parties typically limit table space," Kaiser says. "So I wanted a way to have adjustability, integration, and counter-space." The only thing lacking is a custom hand truck for the trip from the car to the LAN party. ▲

by Joshua Gulick



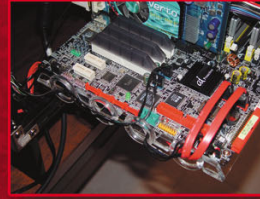
Note the fiber-optic strands that spread to the top of the Lubic Zen-Feng. "The pattern comes from putting the location of my birth, date, time, and looking south into an astronomy Web site, then printing it out on 8.5 x 11 paper as a pattern," Kaiser says. The lit strands shine through holes at the top of the rig.



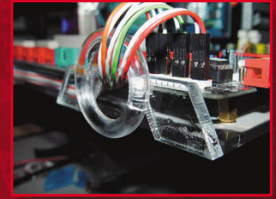
Thanks to folding doors, Kaiser can easily perform upgrades. He used paper to protect the doors from scratches while he assembled the system.



The Lubic Zen-Feng owes part of its name to the Lubic kit that makes up the rig's frame. The kit includes angle joints, aluminum frame bars, and screws.



Plastic rings make for great cord control. Kaiser bought the rings from a local plastics shop and attached them to the motherboard tray via some rhomboid-shaped plastic pieces.



Here is a closer look at Jeff Kaiser's home-grown cable guide.

Give Us Your Mod

Have a computer mod that will bring tears to our eyes? Email photos and a description to madreadermag@cpumag.com. If we include your system in our "Mad Reader Mod" section, we'll send you a \$1,500 Newegg.com gift certificate and a one-year subscription to *CPU*.



1



2



3



4



5

- 1 There's nothing like a waterfall in the middle of your computer. Kaiser says he's never had any trouble with leaking, but he empties the feature via a siphon pump before he moves the system.
- 2 These tinted doors conceal the rig's Plexor DVD+-RW and a Matrix orbital MX512 controller, which handles the water feature and the fiber optics display, among other components.
- 3 Kaiser used a giant hinge to attach the monitor to the Lubic Zen-Feng. He bolted the hinge to the monitor via a VESA backplane.
- 4 Kaiser scrapped the paper he originally bought for the rig when he found this feathery paper, which better matches the Lubic Zen-Feng's theme.
- 5 This is the top of the water feature. The feature has its own water pump, so Kaiser didn't need to include any extra water equipment.



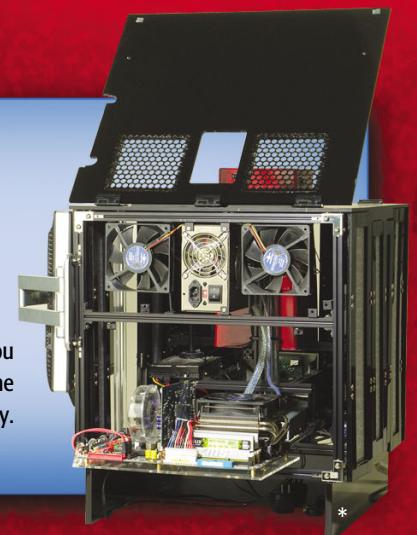
LEDs inside this box send lights to the Lubic Zen-Feng's ceiling.



photos by R Sean Galloway (*)

"I wanted to dress up the back panel a bit," Kaiser says. "I think [the fan] becomes very attractive and not so flamboyant that it overpowers the rest of the case."

Why create a sliding motherboard tray when you can use one that swings? Kaiser added hinges to the Lubic kit's motherboard tray.



advanced Q & A corner

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“ That’s not to say
you can’t mix and
match different
manufacturers’
modules ... ”

Each month we dig deep into the mailbag here at CPU in an effort to answer your most pressing technical questions. Want some advice on your next purchase or upgrade? Have a ghost in your machine? Are BSODs making your life miserable? CPU’s “Advanced Q&A Corner” is here for you.

Vinny O. asked: I’ve been hearing a lot about this new bus technology in next-generation motherboards and PCs called PCI Express. I know that there are PCI-E-type graphics cards out now from ATI and NVIDIA that plug into PCI-E slots on the motherboards, but beyond that I’m totally clueless as to the underlying technology, what it does for performance, future expansion options, etc. Can you enlighten me as to what all the fuss is about? My bottom-line question is, go PCI-E or just stick with good ol’ AGP?

A: Vin, the short answer is yes, go PCI-E.

First, let’s clear up some confusion surrounding your perceptions of PCI-E. Although it does have the same three-letter acronym in its name, PCI-E has very little in common with the legacy PCI bus. PCI-E isn’t a bus-type interface at all. PCI-E is a high-speed, serial (PCI is parallel), dedicated point-to-point connection to system re-sources. Legacy platforms that employ the PCI bus share that interface’s 133MBps of available bandwidth. That’s 133MBps for anything on the bus, sound cards, Ethernet cards, RAID controllers, and the like. Whatever you have plugged into a slot, or even integrated PCI-based chips on your motherboard, share this bandwidth and contend for it. AGP is also a parallel bus dedicated to graphics that supports 2.1GBps of bandwidth for the AGP 8X specification.

PCI-E enables a 250MBps bi-directional (500MB aggregate) for each 1X slot or lane configuration. A PCI-E graphics slot is set up in a x16 or 16 lane configuration, which equates to 4GBps of bandwidth up and down stream for a full 8GBps of available bandwidth for the graphics card. New ATI X300, X700, X800, and X850, in addition to NVIDIA’s GeForce 6 series cards, have over four times the available bandwidth vs. legacy AGP 8X cards. But, the downstream 4GBps bandwidth figure is more important because most upstream calls to the system aren’t as bandwidth intensive.

For other peripherals in your system, a single dedicated 1X slot or lane configuration is more than enough bandwidth for any function you could throw at them. Again, with 250MBps bi-directional dedicated to any specific device, you can imagine that PCI-E-based Ethernet, storage, or sound controllers will have plenty of available unshared bandwidth. Most motherboards based on PCI-E-enabled chipsets have both 1X PCI-E slots and legacy PCI slots because 1X PCI

The DFI LANParty UT nF4 SLI-D motherboard caters to the overclocker in almost every way.



peripheral cards are fairly nonexistent at this point. PCI-E will eventually replace the PCI bus in future PC architectures.

Roger S. asked: My system has been fairly unstable lately and is basically shutting down without notice whenever it feels like it. I'll be working on the desktop or playing a game and then all of a sudden the system decides it's time to power off. It doesn't reset; it literally just shuts down completely. The only thing that has changed in my system config is that I recently upgraded my RAM to 1Gig of total system memory from the single 512MB stick that was in there. I bought some fairly generic PC3200 DDR RAM online, and I'm thinking that might be the source of the issue. Could bad or incompatible memory cause these symptoms? Should I have identical sticks in there now?

A: In general, Rog, there are a few specific sources of system resets or power-down-type crashes. You can trace them back to one of four root causes: excessive CPU or system heat build up, bad or incompatible RAM, a motherboard short-out, or bad/under-powered power supplies. We suggest you rule these out before you replace your system memory.

Because you didn't list your system specs, we'll have to take a stab in the dark on a few things. First, make sure your main processor is running within reasonable heat ranges for most current CPUs. If your processor (Pentium 4 or Athlon 64) is running at a range between 45 degrees Celsius and 60 degrees under load, this probably isn't causing instability. The next step is to look into the power-capacity specifications of your power supply. For most current systems a decent quality/make 350 to 450W supply is sufficient (such as those from Enermax, Fortron Source, SPI [Sparkle Power Inc.], Antec, Thermaltake, etc). If you have a lesser-quality or lower-powered supply in your system and you're trying to provide power to a high-end processor and graphics card combination, you're asking for trouble. So it also might be a good idea to take a look at a system monitoring utility such as Motherboard Monitor (mbm.livewiredev.com) to check your power levels. Are your 3V, 5V, and 12V rails dipping well below their nominal ranges? This could point to a struggling PSU. Once you've ruled out these possibilities, you can look at the possibility of a system memory problem.

Because you noted that you recently installed another DDR DRAM stick, we'll assume that this could be coincident with your system shut downs and is more than likely the cause of the crashes you're experiencing. We'd suggest running Memtest86 (www.memtest86.com) for a thorough system memory diagnosis. Check the specifications of the new RAM you purchased. Do they meet or exceed the specs of the memory you had in your original system? Mixing a PC3200 CAS 3 rated stick in with a system that has been configured for PC3200 CAS 2.5 may not seem like much of a difference, but it could cause a hiccup or two. Besides, your first instinct is more than likely correct. It's best to have a pair of matched DDR DRAM from the same manufacturer with the same specifications to ensure full system stability. That's not to say that you absolutely can't mix and match different manufacturers' modules, but the more variation you have in specs, density, and build type, the higher the risk for system instabilities.

Dracan asked: I just built a new system with the following specs: AMD Athlon XP 2600+ Barton, DFI nForce2 Ultra-AL, 768MB PC2700 RAM, 40GB Western Digital Caviar, Austin 350W PSU, Radeon 9600 XT graphics, and Windows XP Pro. I took the RAM, hard drive, and video card from my old system that worked for around two years. When I powered the new system up, it didn't boot up. I took it to a local computer shop, and they said that the jumper in the hard drive was keeping it from booting. They moved the jumper around, and it booted up fine; however, when it tried to load WinXP, I got a blue screen. The shop tech told me I was going to have to reinstall Windows and format the drive. I don't want to do this unless I absolutely have to. Any advice on what to do here? I don't want to lose my valuable data.

A: Your first issue concerning the unbootable/unrecognized drive is related to the mode in which the drive was set on your previous system that doesn't match your new system's configuration. If you had the drive set up in slave or cable select mode via this jumper on the old system, these settings probably conflicted with the hardware in your new system. The shop tech probably moved the jumper to a master mode position, which is the setting recommended for virtually all boot drive configurations these days regardless of the drive controller you run with on the motherboard. So the system would see this hard drive as the master bootable drive in your system, Windows would attempt to load, and this would lead us to your next issue.

In your old system, Windows was configured and installed based on the hardware and resource requirements that existed within your computer. Your new machine probably has a different set of hardware and software resource requirements, so the old OS install would conflict with the new hardware configuration. Furthermore, it may seem as if Windows should be plug and play capable, but it's not always that easy when you want to install an entire OS. Sure, you can pop in a new sound card without too many hiccups, but booting a new system install on an old and completely different drive OS install is usually a big no-no. Once in awhile you might get away with booting an OS install from within a new system that came from a different system, but more often than not you're looking at a full reformat and reinstall of the OS on the new system.

As a last ditch effort before you reformat the drive, disable every extra peripheral on the motherboard and take out any add-in cards in your system (except for graphics, obviously) that you don't need. Turn off LPT ports, serial and USB ports, extra RAID/drive controllers, and networking controllers in the system via BIOS options and then try to boot that on the old install again. You might get lucky, but the odds are against you. If you have to reformat, try the Files And Settings Transfer Wizard built into WinXP to back up your critical files, email, address book, and other system settings. Then once you have the new OS installed on the drive in your new system, you can retransfer all your critical files and settings from the old system back-up file that the wizard creates. ▲

by Dave Altavilla and Marco Chiappetta,
the experts over at HotHardware.com

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Hard Drive & Flash Memory

A Perfect Match

Some things just go together. Coffee and doughnuts. Apple pie and vanilla ice cream. And a new computing combination that's showing promise is pairing a hard drive with flash memory, creating the HHD (Hybrid Hard Drive). Such a drive will use electrical power more efficiently, providing important benefits for laptop computers.

Longhorn & HHDs

One of the key strategies for Longhorn involves giving consumers new scenarios for personal storage, such as HHD, which Microsoft is developing along with

Samsung. The HHD, currently available as a prototype, will be a key component in future laptops running Longhorn.

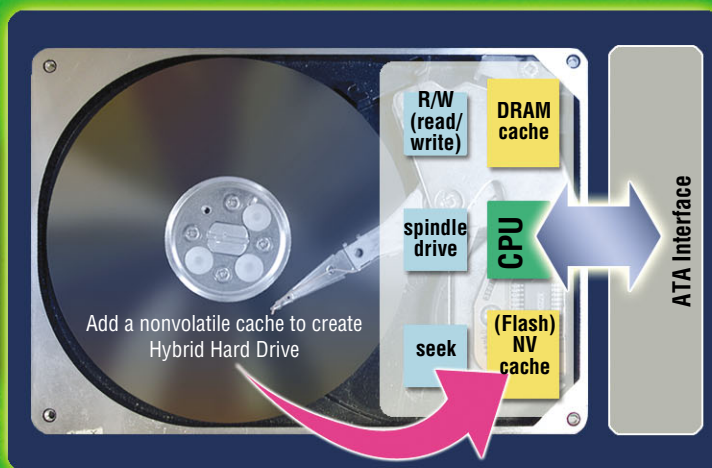
For years traditional hard disk drives have worked well and probably aren't going anywhere soon. However, because they require a large chunk of electrical power to operate, a better solution will likely be welcomed for laptops running on battery power. Microsoft estimates 10 to 15% of a laptop's battery powers the hard drive.

Traditional hard drives are great for storing large amounts of info, but they aren't perfect for retrieving info instantaneously. In a laptop the hard drive's platters sit idle

as often as possible to save battery power. Restarting the spinning platters requires additional power and causes a delay, along with the typical seek and rotational latency found with hard drives.

By including a Samsung nonvolatile (flash) memory device with a hard drive in the HHD, Samsung and Microsoft hope to eliminate delays. As a result of this combination, access to the hard drive occurs less frequently, the platters spin less, and the laptop has a longer battery life. The flash memory can also give the CPU faster and more efficient access to data it needs vs. using the hard drive.

Pair Hard Drives & Flash Memory



Traditional Hard Drive



Hybrid Hard Drive



The HHD combines flash (nonvolatile) memory with a hard drive to create a device that will be aimed at laptop users running the Longhorn OS. In a traditional hard drive without flash memory, the CPU reads and writes data directly from the hard drive. Each time the CPU needs data, it must access the hard drive, which drains the laptop's battery power. In the HHD with a flash memory cache, the CPU mostly reads and writes data to and from the flash memory. (When necessary the flash memory reads and writes to the hard drive, but the OS attempts to minimize this.) This lowers the overall power consumption of the system

and limits the number of times the hard drive platters must spin to read or write data. Because many laptop crashes occur when the hard drive is damaged after the laptop suffers a physical jolt while the platters are spinning and the read/write heads are accessing data, using flash memory as a cache can also help limit the number of times the laptop's hard drive is vulnerable. Finally, the laptop can "wake up" from power-saving mode using the flash memory directly, again saving time and power vs. spinning the hard drive platters each time the laptop exits power-saving mode. ▲

Overcome Problems

Adding flash memory to a hard drive seems like a no-brainer idea. So why has it taken so long to develop the HDD? Three problems have held back the idea.

First, flash memory has just reached the stage where it's available in large enough capacities to make this idea work. Small amounts of flash memory wouldn't provide much benefit because the laptop's CPU would still need to frequently access the hard drive.

Second, to make the overall system work smoothly and efficiently, changes to the

OS are required. Longhorn will have the advanced memory management capabilities to properly manage the flash memory cache in the HDD.

Third, the engineering of such a system is tricky. Not only do engineers have to physically configure the system to make the flash memory and hard drive work in tandem, they also have to make the system cost effective. If the addition of the flash memory raises the price of the HDD laptop higher than a laptop with a traditional hard drive, consumers might not think the benefits are worth the additional cost.

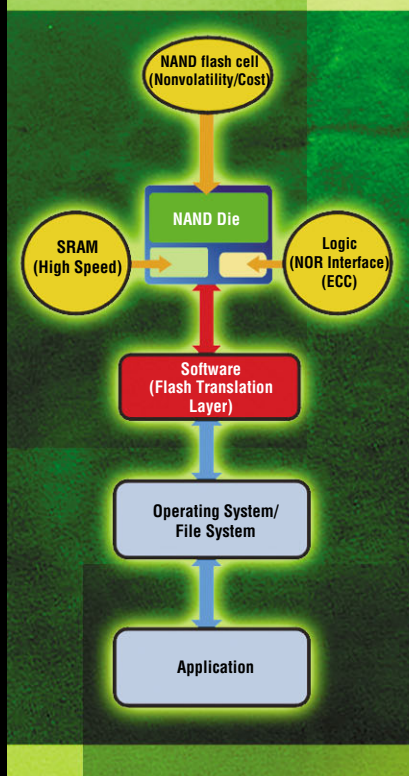
The HDD will incorporate the flash memory within the architecture of the hard drive, which will allow for easier and less expensive implementation of the technology. Because of the engineering, Samsung and Microsoft expect the HDD to be slightly more expensive than comparable traditional hard drives.

Don't plan to see HDDs until after Longhorn's release. Samsung says it expects to see hard drive manufacturers shipping large quantities of HDDs in late 2006. **cpu**

by Kyle Schurman

OneNAND Flash Architecture

The HDD will use OneNAND Flash memory from Samsung. To make the HDD work properly, it's important that the OS supports flash memory and makes it work with the existing hard drive. The FTL (Flash Translation Layer) software controls the flash memory socket, preparing the data for the OS. The OS handles the read/write sector for the flash memory. Finally, the application accessing the data works through the OS and the FTL to find, open, close, read, write, and delete files from within the flash memory. ▲



Use Sleep & Power-Saving Mode

The HDD will work with the Longhorn OS to save power for laptop users, both in general usage and in sleep mode.

Power-Saving Mode

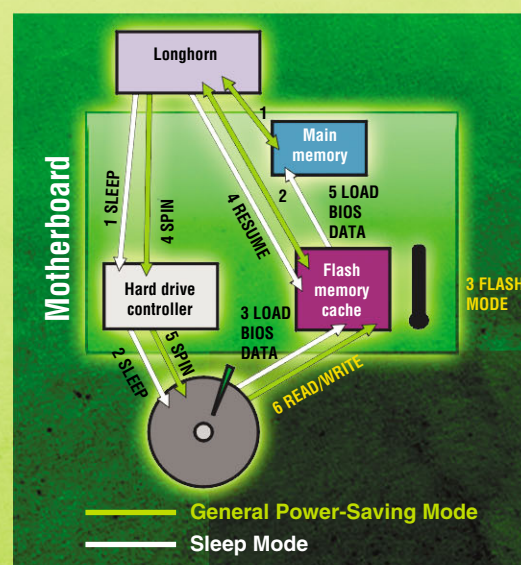
The memory management feature in Longhorn buffers the data in the system's RAM, fulfilling the need for commonly used data (1). Because Longhorn is a 64-bit OS, it will support main memory amounts up to 128GB, which will be able to handle all data requests. (Of course, most PCs won't contain that much main memory when Microsoft initially releases Longhorn.)

When it's time to access additional data, Longhorn places the necessary data in the flash memory cache (2) and spins down the hard disk platters, saving power. All I/O of data goes through the flash memory cache as long as possible.

If the flash memory cache fills (3) or doesn't contain the requested data, Longhorn will tell the hard drive controller to begin spinning the hard disk platters (4 and 5). The flash cache will then write and read its data to and from the hard drive (6). Once the data exchange has taken place, Longhorn again spins down the hard drive platters, saving power.

Sleep Mode

Longhorn sends a signal to the hard drive controller to enter sleep mode (1 and 2). Before shutting down the hard drive, the



data needed to end sleep mode moves from the hard drive to the flash memory area (3).

When the user ends sleep mode, Longhorn sends a signal to the flash memory area (4), which moves the data into main memory (5). The system BIOS then reads the necessary data, letting the laptop power up almost instantly. With a typical laptop, the OS must access the hard drive to find the data needed for the power up, causing a delay of a few seconds while the hard drive controller spins the hard drive's platters and searches for the data the BIOS needs.

Once the laptop is working again, Longhorn's memory management feature removes the data needed for the power up from the flash memory cache and replaces it with the working data. The laptop then follows the general power-saving mode again. ▲

Cyc

The Machine That Wants To Learn

The idea of AI (artificial intelligence) typically comes in two forms: There is the form that Hollywood and science-fiction authors provide, where robots and computers can converse with us on a level that's nearly human, and the form that's reality, in which scientists and researchers continue to make progress in AI development. Although the progress might seem slow to those waiting impatiently for a robot housekeeper, AI development continues to steadily move ahead.

We last discussed AI in detail in the January 2002 issue of *CPU* (pages 50 to 54) and thought it was time for an update. We'll focus on one of the more interesting and promising AI projects: Cyc.

Cyc Simplified

Cyc (pronounced like psych in psychology) is part of Cycorp (www.cyc.com), an AI research company based in Austin, Texas. Computer science pioneer Douglas Lenat started Cyc in 1984 as a

project determined to make machine-usable the millions of pieces of information that humans use to have a common sense understanding of many different situations. After 10 years of research, Lenat formed Cycorp to further the development of Cyc.

As development of Cyc continues, Cycorp is able to create products based on the technology that give businesses access to certain aspects of AI research. In this article, we'll focus on Cyc itself, though.

Cyc Learns

Cyc goes through a comprehensive process to "learn" and add information and facts to its KB. It uses information on the Internet to obtain additional facts for its KB. Here's an example from Cycorp of how the learning process works for Cyc when it uses the Web. In this example, Cyc is trying to learn who was the founder of the COOA (Croc Owners Of America) group.

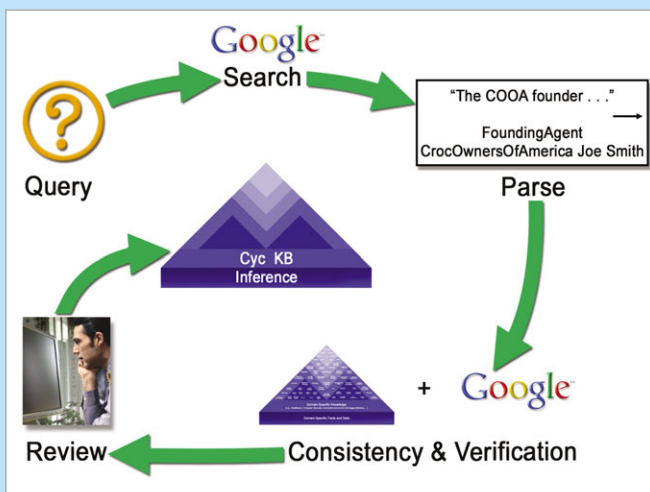
- 1 A legal query is created. Cyc accepts queries formulated in CycL, which is the representation language Cyc uses. Such a query might not be readily understandable by a human who isn't familiar with CycL.
- 2 Cyc translates the CycL into a more understandable text string that it can use for a Web search (such as with Google). Cyc then studies the resulting documents, searching for relevant text strings.
- 3 Cyc analyzes the text strings, looking for the items located closest to the search string. These items are translated into CycL.
- 4 Cyc compares its results to the knowledge already in its KB. Any data that's redundant or incorrect, based on what's already in the KB, is discarded.
- 5 After narrowing the list of relative data, Cyc performs another Web search to verify its narrowed findings. In many instances, Cyc creates statements based on its findings and searches for those statements on Google to verify the results. If a statement doesn't return any results, it's discarded.
- 6 Cyc creates a list of possible answers to the initial query. The final list is far shorter and more specific than the first list of possibilities. A human then reviews the potential answers for accuracy, inserting correct answers into the Cyc KB.

Creating Text Strings For Web Searches

When creating text strings for searching on Google (step 2), Cyc must apply information from its KB to cover all possibilities. In this example, Cyc knows it can reference "Croc Owners Of America" by two other common names, so it performs searches using those names, too. It also knows "founder" and "founded by" are commonly used interchangeably in natural language, so it incorporates those facts into its search text strings to help Cyc find all possible documents that fit the search parameters.

The CycL query:

FoundingAgent
CrocOwnersOfAmerica ?WHO
becomes search text strings such as:
Croc Owners Of America founder
Croc Owners Of America, founded by
COOA founder
COOA, founded by
Crocodile Owners Of America founder
Crocodile Owners Of America, founded by



Source: Cycorp

More than 20 years after its introduction, work on Cyc continues. The Cyc KB (knowledge base) contains hundreds of thousands of “rules” that give Cyc its ability to apply a form of reasoning to a situation. The Cyc KB consists of basic knowledge that humans need in everyday life to make educated guesses about a situation and to understand language. A machine doesn’t naturally have this common sense reasoning ability, so researchers must teach it every possible rule.

Cyc also can search the Web to find answers to queries, which gives it a chance to “learn” on its own. A human still verifies Cyc’s findings, but this aspect of Cyc holds a lot of promise.

Put Cyc To Use

One aspect of Cyc is the development of a TKB (Terrorism Knowledge Base), which Cyc researchers began compiling in 2003. The TKB eventually will contain all known information

about terrorist groups, including leaders, affiliations, and descriptions of any terrorism events. The TKB, which uses the same data searching and “learning” tools of Cyc, can find information in newspaper stories and on the Web. Humans also enter relevant information directly into the TKB.

Cyc researchers enter data into the TKB as mathematical logic statements that let AI machines use the TKB. As the data grows and becomes overwhelming

Applying Common Sense

For humans, applying common sense knowledge and reasoning skills to everyday language is pretty easy. For an AI machine, though, it’s not natural. To give an AI machine common sense reasoning abilities similar to a human, researchers follow a procedure similar to what humans use.

Consider these three sentences:

1. Fred saw the mountains while flying over them in his airplane to Denver.
2. Fred flew to Denver and saw the mountains.
3. Fred saw the mountains flying to Denver.

Take those last two sentences at face value, and they might be a little difficult to understand.

However, for an adult human who has experience with the language, it’s easy to understand what each sentence means. Humans apply common sense to each sentence to understand it.

AI machines need to draw on a database of common sense rules to understand the language. This is similar to what humans do, even if they don’t realize they’re doing it. A human’s “database” is a collection of common sense rules she has stored in her brain.

Sentence 1 is easy to understand; it’s descriptive and complete. The airplane flew over the mountains and Fred rode inside. Little common sense knowledge is required.

In sentence 2, despite the wording, a human naturally assumes that Fred was flying in an airplane, based on common sense knowledge.

A human again assumes in sentence 3 that Fred flew in an airplane, despite the somewhat confusing language. It just becomes a natural, subconscious aspect for humans who understand a language.



An AI machine needs to know that an airplane flies, mountains stay on the ground, and humans ride in airplanes, among other rules, to comprehend this sentence. Cyc pulls such information from its database.

An AI machine would need several pieces of information from a database to come to the conclusion that Fred was in an airplane. The machine would have to have rules in its database that say things such as “humans cannot fly,” “airplanes can fly,” “airplanes can fly over mountains,” “humans can ride in airplanes,” and “when humans ride in airplanes, they often use the phrase ‘the human flew’ as part of the natural language,” among other rules. With enough rules in its memory, Cyc could determine that Fred was flying in an airplane when he saw the mountains.

The AI machine again needs to pull a couple of dozen rules, such as “mountains cannot fly,” from its database to comprehend this sentence, which omits a few details (a common practice in natural, everyday language). Giving AI machines the ability to decipher and comprehend natural language is one of the most challenging aspects of AI research. Cyc contains many rules for understanding natural language.

The idea of AI typically . . .

for most types of software to use, AI tools become vital to search the TKB and make the necessary correlations among the data strings. Such work gives authorities the opportunity to find hard-to-decipher correlations in information about terrorists, possibly leading to arrests.

Cyc Moves Forward

Cyc's potential is almost limitless, but developing it is a steady process that's not going to happen overnight. As Cyc continues to develop, look for Cycorp to continue to create offshoots and new products based on its research.

If you still want the robot housekeeper, though, there's hope: Cyc's research eventually could lead to some of the technologies and "learning" that's needed to make such a device work. It's not going to happen tomorrow, but in another decade, who knows? ▲

by Kyle Schurman

Breaking Down Cyc

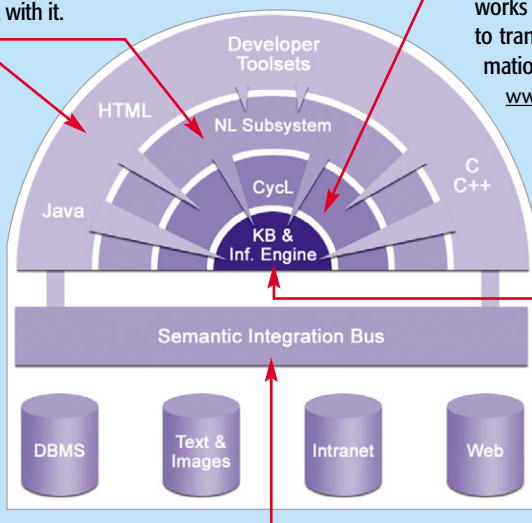
Creating and running Cyc requires that several tools work together, some of which are part of everyday computing. This diagram explains the different layers of Cyc.

NL Subsystem. Cyc's NL (natural language) subsystem is a key tool that helps Cyc understand queries and interact with humans, but it's also one of the most challenging to develop. The lexicon aspect of the NL subsystem (shown at right) breaks sentences into their probable parts of speech. The syntactic parser then determines all possible structures for the sentence, which gives Cyc the best chance to properly understand it. For example, this sentence could mean John actually saw a light, or it could mean John realized something, described by the phrase "saw the light." Finally, the semantic interpreter reworks the sentence in CycL, which lets Cyc work with it.

"John	saw	the	light	with	the	telescope."
Proper Noun	Verb Noun	Determiner	Verb Noun Adjective	Preposition	Determiner	Noun Verb

CycL. CycL is Cyc's representation language. It's a flexible knowledge representation language that Cyc works in all of the time. It must use the NL subsystem to translate into and out of CycL. (For detailed information on CycL's syntax, check the Cyc Web site at www.cyc.com/cycdoc/ref/cycl-syntax.html.)

Developer Toolsets. Users and researchers use these toolsets to interact with Cyc, whether it's for browsing the KB, editing the KB, or posing queries to Cyc. Cyc's HTML browser is one of its most important tools because it provides users with a familiar interface and hypertext links for using the KB. Cyc creates HTML pages with its information on the fly. The developer toolsets also include programming languages (such as C and C++) and a programming tool (Java).



KB. The Cyc knowledge base contains hundreds of thousands of facts that are basic to knowledge and common sense abilities naturally used by humans.

Inference Engine. Cyc's inference engine performs the general logic deductions that make it such an interesting project. Because Cyc's KB is so large, researchers couldn't use approaches other developers have commonly followed to create inference engines for other AI projects.

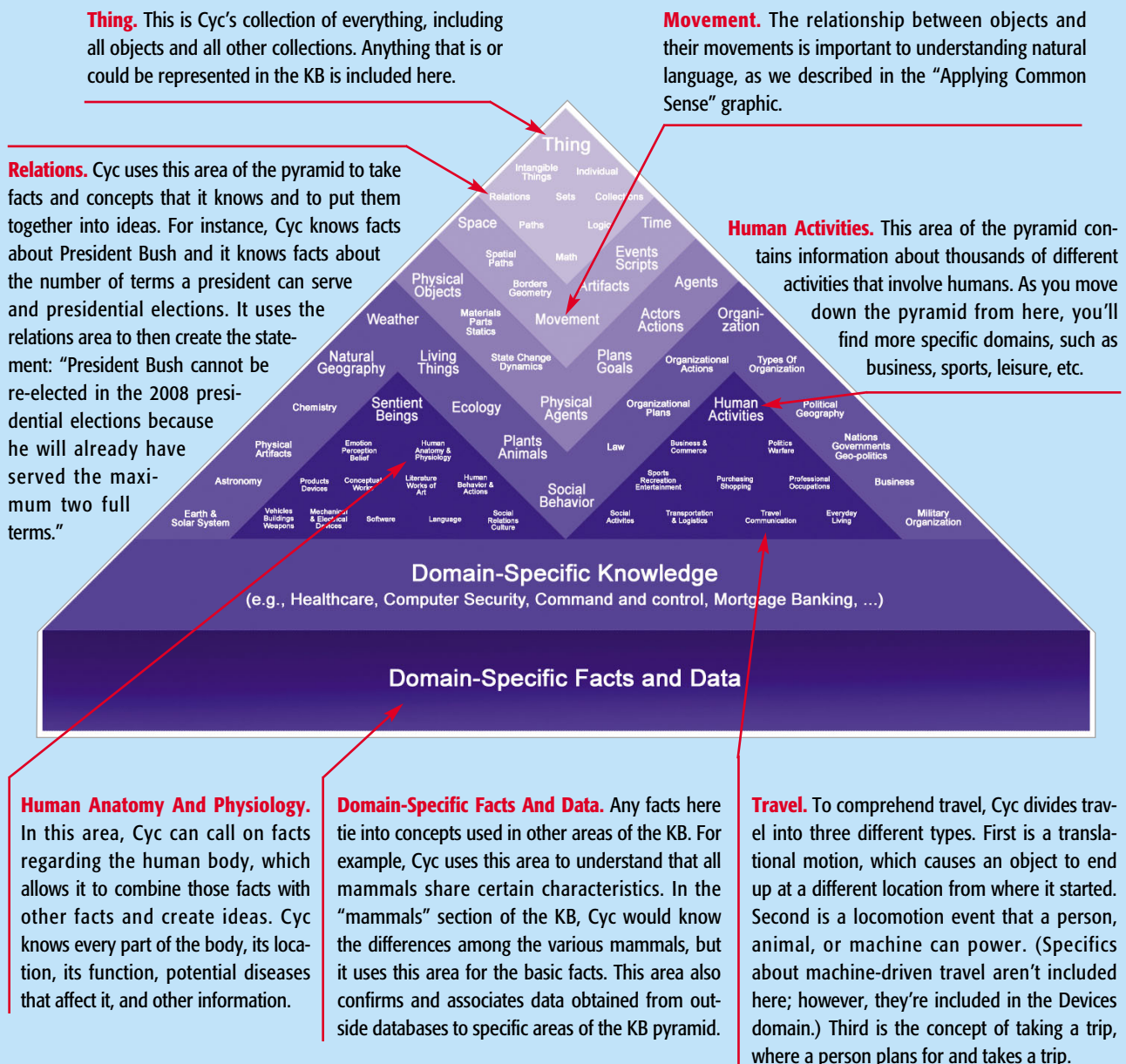
Semantic Integration Bus. Because information is stored in so many different formats, such as databases and word processing documents, Cyc must be flexible when it accesses the data it needs. The different formats also are organized in dissimilar ways (a database is highly organized, while a text document is less organized), which means Cyc must be flexible in how it searches. The Semantic Integration Bus handles the management of the different data sources, which allows Cyc to work with them.

... comes in two forms ...

The Cyc Knowledge Base

The Cyc KB is constructed like a pyramid, with the top of the pyramid being the most comprehensive area. As you move down the pyramid, you'll find more specific pieces of information. The base

of the pyramid contains important information used throughout the pyramid. We'll look at a few areas of the KB to give you an idea of the type of information the KB contains.



Source: Cycorp



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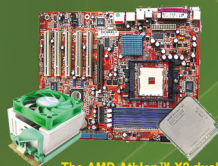
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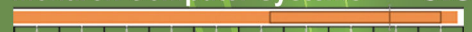
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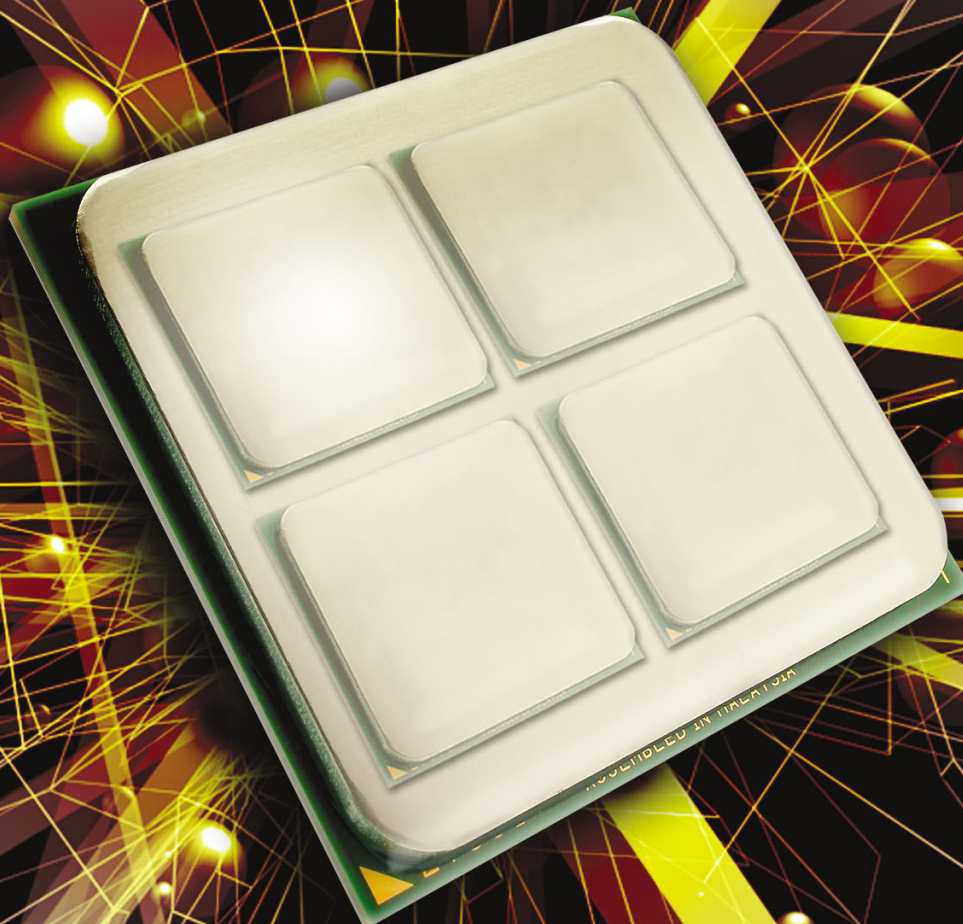


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SMP (symmetric multiprocessing) has been around for years. In the past, only server and workstation markets took advantage of this computer architecture, in which two or more identical processors connect to a single, shared main memory resource in support of simultaneous multithread execution within an OS and/or applications that support it. So obviously, with more than one processor at your disposal, you can do more work within a given clock cycle. Conversely the consumer desktop PC market has been slower to adopt and take advantage of multiprocessing and multithreaded applications; although, Microsoft's OS has supported SMP since the dawn of Windows NT/2000 and the consumer-targeted Windows XP.

A Generational Shift

Recently, however, there has been a paradigm shift in the PC arena. The seeds of true, widespread adoption of multiprocessor architectures and applications that take advantage of them have been sewn. Technology from a hardware standpoint is now in place, thanks to the efforts of various chipset manufacturers who have driven an evolution in the ecosystem that was needed to support the benefits of parallel processing. But how important are multi-CPU architectures and multithreaded software going to be for you, in the short and long term? Dare we say *very* important? We dare for a myriad of reasons that we'll discuss here (see pages 25, 26, 54, and 60 in this issue). The computing world is definitely heading down this path, but let's first talk about laying the foundation for the dual-core processor in the mainstream desktop arena and then we'll come back to market adoption of the technology and the obvious benefits in performance.

The Hyper-Threading Period

Thus, while the workstation and server markets were enjoying the benefits of multiprocessor systems, Intel started blazing the trail in the consumer desktop space in 2002 with the introduction of its Pentium

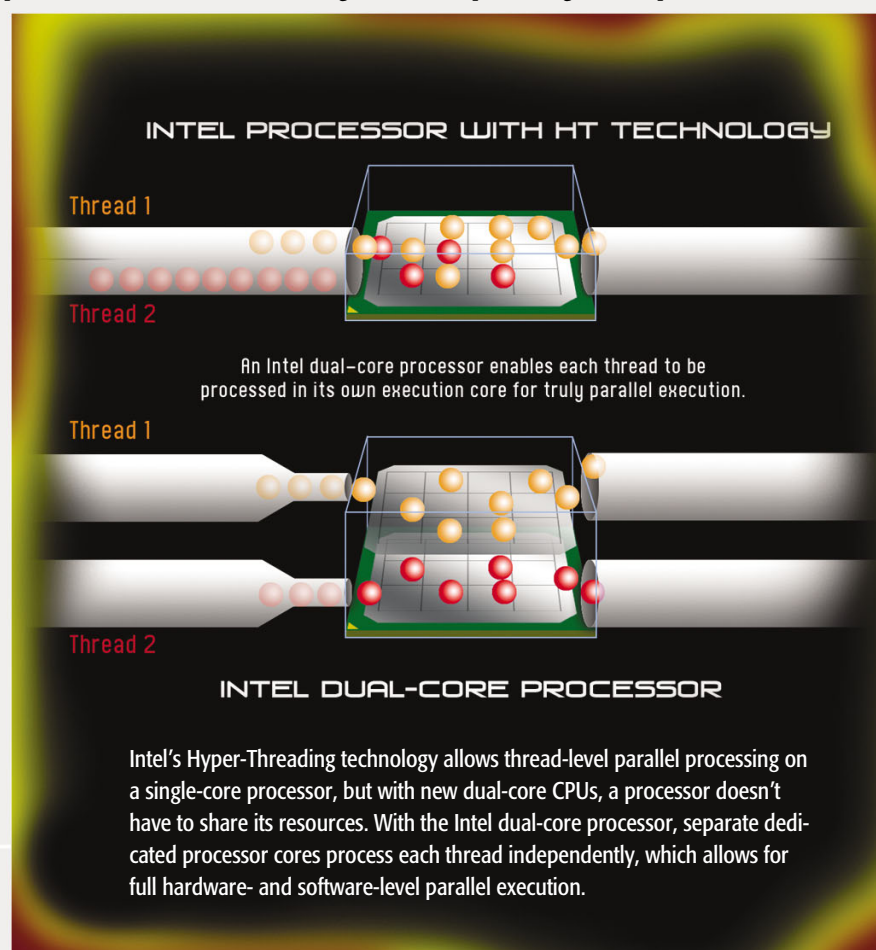
4 processor with Hyper-Threading support. Intel's initial effort, however, started in the '90s with a suite of threading tools. According to Jeff Austin, manager in Intel's Digital Enterprise Group, these tools were, "a very focused threading-enabling program, giving software developers access to HT-based development platforms and related tools." From a high-level view, the underlying technology lets a single processor core process two threads in parallel, allowing for more efficient use of available processor resources. Though essentially just an additional set of registers and support circuitry, these single-core Pentium 4 CPUs look like two virtual processors to a multiprocessor-aware OS.

Although the benefits of Hyper-Threading in multitasking scenarios were slightly tangible to the end user back in the day, a true multithreaded application, such as media encoding with Windows Media Encoder, showed significant gains in performance. There was no question at this point that Intel had seen the writing on the

wall with respect to ever-increasing brute-force clock speed reaching a point of diminishing returns in performance. But in contrast, we now know Hyper-Threading was only a step in the right direction toward the true multithreaded processing of today, with the introduction of new dual-core platform architectures.

Dual-Core: Beginnings

There is a big difference between Intel's Hyper-Threading technology and a true dual-core CPU because with dual-core technology there are two fully independent processors on the same die. And, although a Hyper-Threading-enabled single-core Pentium 4 must share a single core's processing resources between multiple threads, a true dual-core CPU doubles the hardware-level compute resources for any given processing workload. The net result is that, in a fully multithreaded application, the performance increase should start to scale to about two times the performance of a similar clock speed single-core processor. And with



Hyper-Threading technology available on higher-end Extreme Edition Pentium 840 CPUs, the OS sees the processor as four virtual processors, two of which are full hardware-level cores, each with two processing states available to the OS and application space. Regardless, with the advent of true dual-core processor architectures, the market is now ripe to fully exploit the benefits of multithreading applications.

However, things aren't always as easy as they seem, and manufacturing process technologies at Intel and AMD had to evolve such that power consumption and thermal characteristics were still manageable with two full processor cores on the same die. Damon Muzny, AMD public relations, says, "AMD looks at Hyper-Threading as a sort of Band-Aid. In software, where there is a need for multithreaded processing, true dual-core designs provide a much better solution. For AMD, stepping into 90nm turned that plan into silicon." In addition, AMD and Intel took different design approaches to their dual-core offerings; AMD built in a cross-bar switch for each Athlon 64 or Opteron core to talk to the chip's onboard memory controller and

HyperTransport link, whereas Intel's design dropped another Prescott core down on its QDR (Quad Data-Rate) FSB to allow access to the external memory controller on the motherboard northbridge chip. Finally, with two processor cores, the rest of a system around a CPU would need the bandwidth to support getting onto and off these new twin turbo engines quickly.

With two processor cores, an evolution of the ecosystem had to occur to balance performance across the various Intel- and AMD-based platforms. Considerable progress has definitely been made, though, enough to allow dual-core CPUs to stretch their legs a bit more now and a lot more down the road.

PCI Express

One milestone that has helped drive dual-core progress was new high-speed point to point connections, such as PCI Express. If the world is going the way of the dual-core CPU, then it's most certainly going serial. And, more specifically, the serial interconnect standard known as PCI-E will become essential for modern PC architectures.

PCI-E is a dedicated serial point to point communications link for either onboard chip to chip communications or board to board communication. It will also eventually replace the aging PCI bus, which is a shared resource architecture. But, PCI-E links run at 2.5Gbps or 250MBps per lane in each direction, which provides a total bandwidth of 500MBps for an X1 config up to 8Gbps (4GB bi-directional) for an x16 graphics slot. And these links are dedicated, so any device in a slot doesn't have to share the bandwidth, and issues such as bus contention are completely eliminated.

Jeff Austin at Intel says, "The ability to deliver a balanced architecture that can provide needed platform-level bandwidth was key to maximizing dual-core performance. With the new Intel 945/955X-based platforms, there have been a number of bandwidth-related improvements, including support for DDR2 memory running at 667MHz, as well as four Serial ATA ports running at 3GBps." Here's that "serial" word again, but relative to storage, which was one of the first frontiers for dedicated serial connections in the desktop and introduced in 2002. Serial links allow more

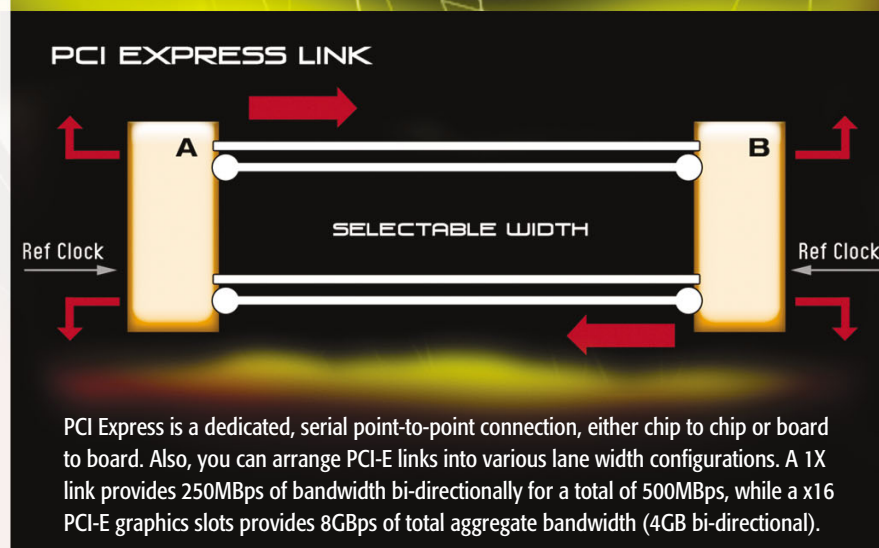
Dual-Processor Chipset Comparison Chart

There are a number of motherboard chipset suppliers offering PCI Express-based products that support dual-core processors from both AMD and Intel. This chart has high-level details and the base configurations of each chipset from the top players in this arena, as well as the platform architecture they support. Note that each vendor has both AMD- and Intel-based products, all with a common set of features and functionality. Graphics rivals NVIDIA and ATI also add the ability to pair up two of their 3D graphics cards for higher-end gaming performance, while VIA offers two slots of discrete independent

PCI-E graphics for multidisplay support. All of the chipsets in the chart are validated to support dual-core processors from either Intel or AMD, but check with the specific motherboard manufacturer of your choice to confirm actual support. Other factors beyond BIOS level support, such as the power array, may have to be taken into account, with the exception of i945- and i955X-based motherboards for Intel processors (which are designed specifically to support Intel dual-core CPUs). That said, NVIDIA, ATI, and VIA all claim to officially support dual-core processors in the chipset architectures in this chart. ▲

Chipset/Vendor	Intel i945	Intel i955X	NVIDIA nForce4 SLI	NVIDIA nForce4 SLI
Platform	Intel	Intel	Intel	AMD
CPU	Pentium 8XX Series	Pentium 8XX and Extreme Edition	Pentium 8XX and Extreme Edition	Athlon 64 FX X2
PCI Express (number of lanes)	20 up to 22 with ICH7R southbridge	20 up to 22 with ICH7R southbridge	20	20
Dual Graphics/Mode	Not validated	Not validated	Yes/SLI	Yes/SLI
Memory Type	DDR2	DDR2	DDR	DDR
SATA Drive Support/Ports	3Gbps/4	3Gbps/4	3Gbps/4	3Gbps/4
PATA Drive Ports/Drives	1/2	1/2	2/4	2/4
SATA RAID Support	Yes	Yes	Yes	Yes

** Chart is not exhaustive in terms of features or other third-tier vendor offerings in the market.



available bandwidth and eliminate the bus contention issues associated with legacy Parallel ATA's shared-channel approach.

Chipsets

With all of this newfound serial technology and memory and system bandwidth available to usher in the age of dual-core, the motherboard chipset arena has been on fire lately, creating various incarnations and productizing all the new technology in support of either AMD- or Intel-based platforms. Intel introduced its PCI-E enabled i955X and i945 chipset, specifically in support of dual-core Pentium 8XX series CPUs. NVIDIA followed by introducing the nForce 4 SLI Intel Edition, which also let dual PCI-E graphics cards work in tandem for nearly twice the performance in many gaming scenarios. Then there's NVIDIA's AMD version of the nForce 4 SLI chipset that supports dual graphics, as well as dual-core AMD X2 CPUs with a

BIOS upgrade. Finally, both ATI (Cross-Fire) and VIA have announced support for these new dual-core processors.

There's certainly no shortage of motherboards out there from all the top manufacturers, such as ASUS, MSI, and DFI, and with future processor releases from both Intel and AMD camps on the horizon, you're probably wondering when dual-core processors and applications that support multithreading will become more mainstream. With AMD, for example, the upgrade to these new platforms will be a bit easier because, in most cases, a user will only have to update his BIOS.

Cost & Availability Factors

Still, there is certainly always a cost factor to both sides of the upgrade equation, whether your proclivity is an Intel- or an AMD-based machine. AMD's Muzny says, "AMD has more frequency in the can," but "it's really the processor's architecture that

has put it on top with regard to application performance." This gives us hope that the Athlon 64 X2's introductory pricing will improve, as further process refinements allow for higher yields and lower cost. Intel seems to be approaching things differently, however, by offering some fairly price-competitive models, right out of the gate. Austin of Intel says, "Intel expects to ship millions of dual-core units over the course of 2005, while further ramping in 2006, and expects to exit 2006 at a ship rate of greater than 70% of the Pentium-class client processors for both mobile and desktop." Austin also says, "there are greater than 150 client-based applications currently that can take advantage of the benefits in HT Technology and in Intel dual-core processors." AMD seems more conservative on the idea, suggesting that the move to multithreaded coding in the developer community is a difficult challenge.

The Age Of Dual-Core

Regardless of these differences, the general consensus is that multithreaded applications and the benefits of dual-core processors will reach serious critical mass within the next year to 18 months. The dawn of the dual-core is happening now. Rest assured the competitive landscape will soon change again. Computing things faster with more clock cycles will be far less important than providing multiple, simultaneous compute operations in a single clock cycle. The megahertz myth has just been blown out of the water, once again. ▲

by Dave Altavilla

NVIDIA nForce4 Ultra	NVIDIA nForce4	ATI Radeon Xpress200	ATI Radeon Xpress200	VIA PT894 Pro	VIA K8T890
AMD	AMD	Intel	AMD	Intel	AMD
Athlon 64 FX X2	Athlon 64 FX X2	Pentium 8XX and Extreme Edition	Athlon FX 64 X2	Pentium 8XX Series and Extreme Edition	Athlon FX 64 X2
19	19	20	20	20	20
No	No	Yes/CrossFire	Yes/CrossFire	Yes/Discrete	Yes/Discrete
DDR	DDR	DDR2	DDR	DDR2	DDR
3Gbps/4	1.5Gbps I/4	3Gbps/4	3Gbps/4	1.5Gbps/4	1.5Gbps/4
2/4	2/4	2/4	2/4	2/4	2/4
Yes	Yes	Yes	Yes	Yes	Yes

** Chart is not exhaustive in terms of features or other third-tier vendor offerings in the market.



Additional dual-core coverage in *CPU*:
 Intel Pentium Extreme Edition 840: Dual
 Core; July 2005, page 24; June 2005, page 8
 AMD Athlon 64 X2 4800+; this issue, page
 25; July 2005, page 16
 Opteron vs. Xeon; June 2005, page 64
 Intel Pentium D; this issue, page 26

DUAL-CORE DESKTOP SHOWDOWN

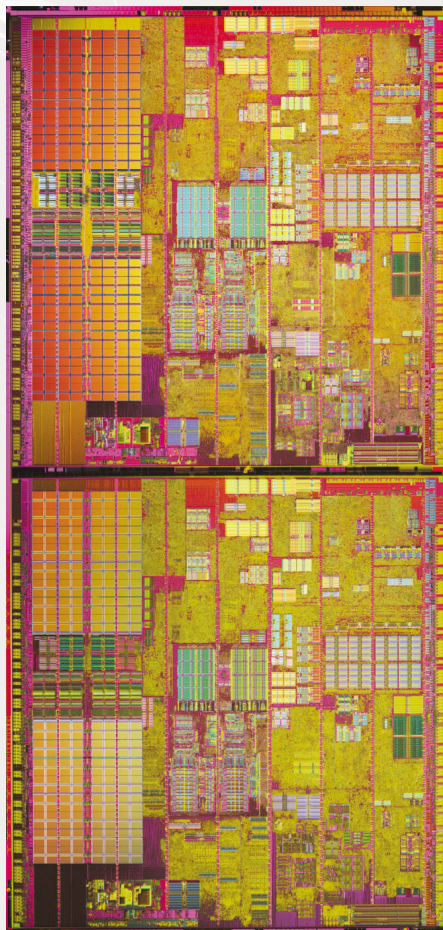
AMD's Athlon 64 X2 vs. Intel's Pentium D

In the past, you would have known that the 3.8GHz Pentium 4 670 was faster than the 3GHz 630 because of the difference in operating frequency. A little more investigative prodding tells you that clock speed aside, AMD's Athlon 64 FX-55 at 2.6GHz is an even better gaming processor due to its proficient architecture.

Now, both prolific CPU manufacturers are asking you to disregard the days when clock ticks translated into raw performance and buy into their dual-core plans.

But why the big push for multiple processing cores? Why would anyone sacrifice those coveted megahertz in favor of two Pentium or Athlon processors on a single piece of silicon? In short, two cores operate concurrently with properly optimized software to get more work accomplished in less time. Rather than plow through one thread, dual-core chips effectively juggle a pair of threads, achieving improved efficiency.

Of course, if the application isn't written with multiprocessing in mind, it operates exclusively in one thread, circumventing the benefits of multiple cores and complicating the decision to stay with single core for now or take the leap into dual. If you were to ask an Intel representative, he'd tell you that dual core is the way of the future, which is why the Pentium D and Extreme Edition 840 currently spearhead the company's efforts and serve as a foundation for future server, workstation, and



Intel's Smithfield core essentially consists of two Prescott cores on a single die communicating over an 800MHz bus.

Overclocking Dual-Core Processors

Because the dual-core offerings from AMD and Intel run at reduced clock speeds, overclocking is naturally the first step many enthusiasts will want to take in an effort to regain sacrificed frequency. But it's important to remember that the two manufacturers cut back on megahertz for technical reasons, not marketing.

AMD representative Damon Muzny paints a relatively straightforward picture of complexity affecting overall yield and manufacturing processes adapting in kind. "Manufacturing isn't as cut and dried as it often appears to be. We have many figurative ingredients at our disposal as we perfect a given recipe. The Athlon 64 FX-55 was a good example of AMD stepping in with a new ingredient (strained silicon) to harvest additional performance from the architecture. We'll make similar improvements to the recipe as dual-core evolves, ratcheting up performance over time."

Intel's official explanation centers more on power management. "The power benefits that we get with the slight reduction in frequency (in the case of the Intel Pentium D Processor to 3.2GHz), enable us to add in the second complete execution core into the processor and roughly keep the same power envelope, while significantly increasing the overall compute performance," says Jeff Austin, product marketing manager with Intel's digital enterprise group. As it stands, Prescott is a complicated core with 2MB of cache. Moreover, the 90nm manufacturing node wasn't the silver bullet Intel needed to quell Pentium 4's power and thermal issues. With those variables in mind, along with Pentium D's relative immaturity, it's hardly surprising to see 3.2GHz top speeds.

At the end of the day, though, both AMD's Athlon 64 X2 and Intel's Pentium D are similar to the single-core models that preceded them. As such, you'll use the same techniques for overclocking. The complexity issue is merely an obstacle to overcome.

At a minimum, our goal was to get each competing processor running at the speed of a flagship single-core model. In AMD's

case, we shot for 2.6GHz, matching the Athlon 64 FX-55. An FX-57 arrived in the middle of testing and the target was revised to an extremely aggressive 2.8GHz. Intel's Pentium Extreme Edition running at 3.2GHz needed to close an even greater gap to match the 3.8GHz Pentium 4 570 and 670 models. Fortunately, ASUS' A8N-SLI Deluxe is equipped with plenty of tweaking options and a mature BIOS capable of handling the Athlon 64 X2 4800+. Even more exciting, Intel's D955XBK motherboard is the company's first with comprehensive support for manual configuration of previously restricted settings. Multiplier manipulation, FSB frequencies in 1MHz increments, and voltage adjustments are all available as long as you accept Intel's disclaimer.

Overclocking the Pentium EE 840 is easier since Intel started unlocking the clock multipliers on its high-end parts. Note that the Pentium D is still locked, although certain motherboards let you choose a 14X default and play with bus speeds from there. Using the Intel D955XBK, however, we specified a 19X multiplier (up from the default 16X) and augmented voltage to 1.5V (from 1.4V). Stock air cooling facilitated a stable 3.8GHz. We were able to boot at 4GHz, though no combination of voltage settings and bus frequencies could coerce Windows to finish booting. The Pentium EE 840 may have 230 million transistors and dissipate ridiculous amounts of heat, but limited to 3.2GHz this four-threaded monster is not.

The Athlon 64 X2 4800 is a little trickier. Although you can reduce its clock multiplier, settings higher than 12X are off limits. Consequentially, overclocking becomes a balancing act among voltages, frequency settings, and HyperTransport ratios. Our final configuration, tuned for processor speed, wound out at 2.8GHz through a 233MHz bus, 12X CPU multiplier, 4X HyperTransport ratio, and 1.5V setting. Attempts at 240MHz successfully booted; however, Windows wouldn't load. ▲

mobile dual-core products. There's a good chance that you would get the same story from AMD, followed by a qualification claiming existing game enthusiasts will continue realizing optimal performance from a single-core CPU. Hence, AMD isn't putting all of its emphasis on the Athlon 64 X2 lineup quite yet. The 2.8GHz Athlon 64 FX-57 continues garnering affections from enthusiastic gamers.

Battle Royale

Despite the eerily synchronized timing of dual-core hardware from both AMD and Intel, the two manufacturers are approaching sales and marketing somewhat differently. To begin, AMD's focused on the workstation and server markets,

while Intel's turning to more mainstream avenues. Thus, the Athlon 64 X2 is a pricey piece of work, though arguably more elegant. Intel's solution is really priced to move. Entry-level video editors and graphic artists on a budget may be more likely to take the Pentium D route, even in light of its identifiable bottlenecks.

But there's no denying that AMD's execution is improving. The original Athlon 64 followed Opteron by six months. This time around, the Athlon 64 X2 trails its dual-core server counterpart by only two. And now, both Socket 940 and Socket 939 processor interfaces are armed with dual-core solutions for those with the flexible budgets.

Intel, on the other hand, is relying on its massive manufacturing capacity to

propel acceptance of dual-core technology. The Pentium D and Athlon 64 X2 both occupy roughly 200mm² of die space with close to 230 million transistors each. However, the former sells for less than half of the latter's price at each model level. AMD says price is a reflection of performance, while Intel claims the strategic advantages of establishing a large install base of dual-core customers.

Athlon 64 X2: Tried & True

AMD has done well for itself by spinning a potent architecture off into numerous product families. The Opteron, Athlon 64, and Turion 64 all share common elements that have kept Intel on its toes in the enterprise space, the desktop, and mobile market. It's hardly surprising

Comparing The CPUs

	AMD Athlon 64 X2	Intel Pentium D
Die Size	199mm ²	206mm ²
Transistors	233.2 million	230 million
Process Technology	90nm SOI	90nm strained silicon
Thermal Design Power	110W	130W, 90W
Max Icc	80A	125A, 100A
L1 Cache	64KB+64KB data, 64KB+64KB instruction	16KB+16KB data, 2X Execution Trace Cache
L2 Cache	512KB+512KB or 1MB+1MB	1MB+1MB
Frequencies	2.2GHz and 2.4GHz	2.8GHz, 3GHz, and 3.2GHz
Core Interface	On-die crossbar	Frontside bus
Chipset Support	ATI, NVIDIA, SiS, ULI, VIA	Intel, NVIDIA, SiS

then that the Athlon 64 X2 nearly mirrors the dual-core Opteron previewed just a couple of months ago.

Of course, the principal difference is an incompatible socket interface—939 pins vs. 940. That one pin means Athlon 64 X2 processors aren't constrained to registered DDR memory. Socket 939 motherboards cost less, the platforms are slightly faster, and the RAM is more readily available. In all, it's a winning combination for the Athlon 64 X2.

During the dual-core Opteron launch, AMD advised interested buyers to consult with their motherboard manufacturers before assuming Socket 940 platform compatibility. Some of the earliest boards didn't have the power handling to cope with dual-core demands. But because Socket 939 was developed later, all corresponding motherboards are said to support the architecture with the aid of a BIOS update.

Internally, the X2 consists of two processing cores, each with 128KB of L1 cache and a dedicated 1MB L2, connected to a system request queue and crossbar. Both cores communicate with each other over that interface at full processor speed, achieving efficiency beyond the Pentium D. They share a single memory controller and HyperTransport link, neither of which has changed since the original Athlon 64 migrated to 90nm. In all, the architecture is familiar, save that second core, and that has been AMD's goal all along. "We designed K8 with multicore in mind," says AMD representative Damon Muzny. "As such, we're able to offer a revolutionary product that fits nicely within the power and thermal infrastructure already available."

Differentiation amongst models is a function of cache size and clock speed, just like today's Athlon 64. The top-end 4800+ runs at 2.4GHz with dual 1MB caches. The 4600+ below it also chugs along at 2.4GHz, but wields two 512KB caches. Stepping down a notch, the Athlon 64 X2 4400 runs at a reduced 2.2GHz and regains 1MB L2s.

Pentium D: Strutting Its Stuff

Intel's Pentium D doesn't offer such a rosy upgrade path. Already dissipating 130W at 3.2GHz,

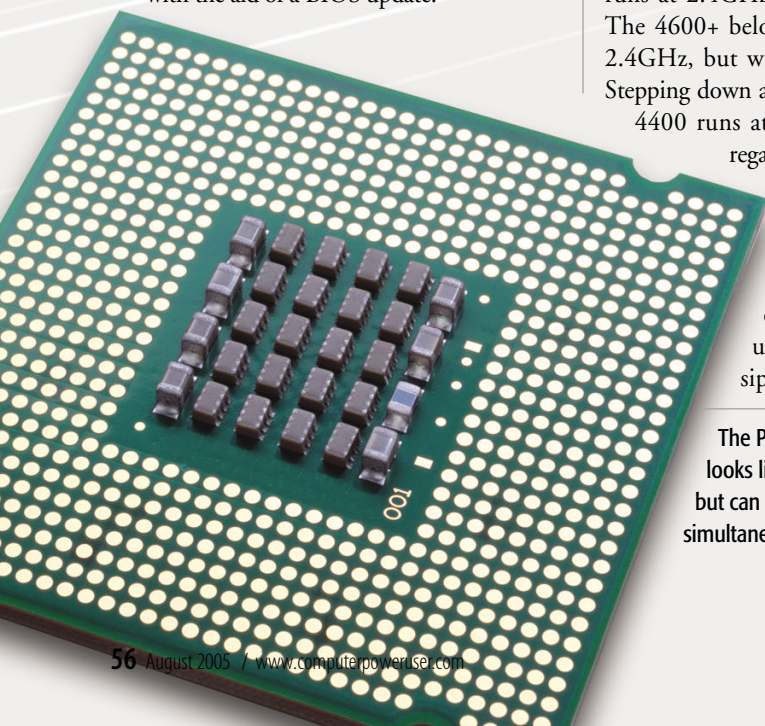
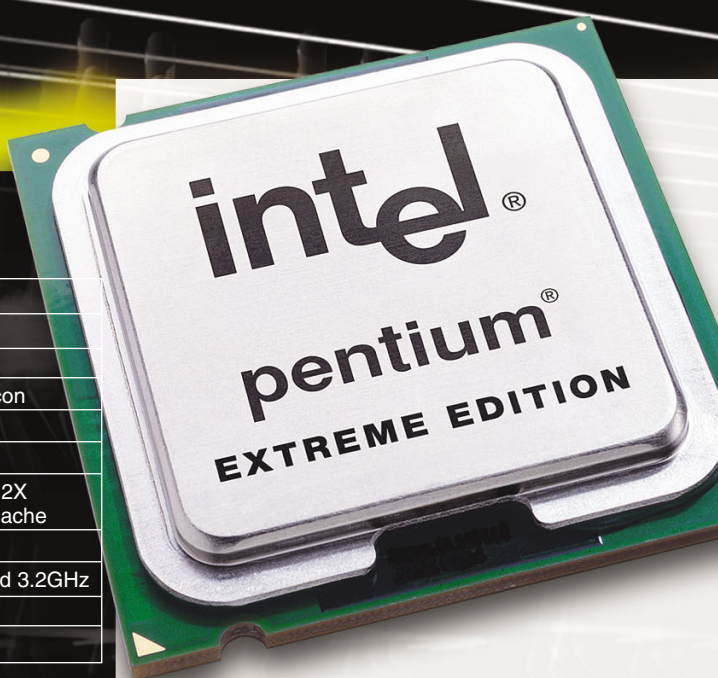
The Pentium Extreme Edition 840 looks like any other Pentium 4, but can process four threads simultaneously.

Despite its LGA775 interface and 800MHz FSB, the Pentium Extreme Edition requires an entirely new platform.

an entirely new chipset is required to support the dual-core chip. Of course, Intel views the transition as a positive move responsible for introducing new technologies. "We continue to focus on driving the platform forward at Intel and, as such, we see the new additions to the Intel 945/955 chipset family as important to delivering the overall better end user experience," says Jeff Austin, product marketing manager in Intel's Digital Enterprise Group.

Beyond the new chipsets, with their DDR2-667 memory support and ICH7 controller hubs, Intel is promoting Pentium D sales through aggressive pricing. Austin states that the consumer market is Intel's initial focus, with mainstream business coming online by 2006. And, thanks to entry-level price point, millions of dual-core processors are expected to sell this year. By the end of 2006, dual-core hardware may constitute more than 70% of the desktop and mobile Pentium processors sold.

Not all has changed, though. The Pentium D is still designed to fit into an LGA775 interface. It runs on the existing 800MHz FSB, as well, which the processor uses as an avenue for each core to communicate. The onboard L2 caches weigh in at 1MB per core if only because a pair of 2MB repositories would be far too complex for 90nm manufacturing. Still, performance in threaded applications, even at



Dual-Core Lingo

So you're down with the latest street slang, but did you know that Glidewell is expected in Q1 '06 wielding Dempsey on a Blackford chipset with Sunrise Lake? If not, it's time to study up on your dual-core code names for the coming year.

Intel claims to be working on 15 dual-core projects concurrently for the desktop, mobile, server, and workstation markets. Smithfield, the chip now known as Pentium D, is the first and only such product available to buy. Presler is the follow-up to Smithfield, slated for a 1H '06 introduction. Similar to today's Pentium 4 600 series, each core in the Presler design will wield 2MB of L2 cache. Why the wait? Intel needs to get its 65nm manufacturing node online before putting two larger dies in a single package makes financial sense. And therein lays another subtle difference between Smithfield and Presler. Whereas the former consists of one large piece of silicon consisting of 230 million transistors, a single Presler processor will sport separate dies, which should minimize yield issues and promote higher clock frequencies. A single-core variant called Cedar Mill is slated for the same time frame, also employing 65nm manufacturing. Intel says that both cores will feature 64-bit extensions and Execute Disable. Cedar Mill will also enjoy Hyper-Threading functionality.

The first Intel processor to employ 65nm manufacturing won't be a desktop chip. Rather, it'll be Yonah, the first mobile dual-core architecture expected early in 2006. The plan is to preserve the low power consumption numbers of today's Pentium M in a package consisting of 151 million transistors and operating on a 667MHz shared FSB. Currently thought to have 2MB of shared L2 cache, Intel seems to be leaving out its 64-bit extensions once again. Instead, Intel is focusing on a broader platform message with Calistoga and Golan, the supporting chipset and wireless complement. Little information is available about either.

On the workstation side, Dempsey will be the first dual-core chip from Intel to enable dual-processor support, wielding four physical execution cores. It'll be manufactured at 65nm; have two dies on a single package; and

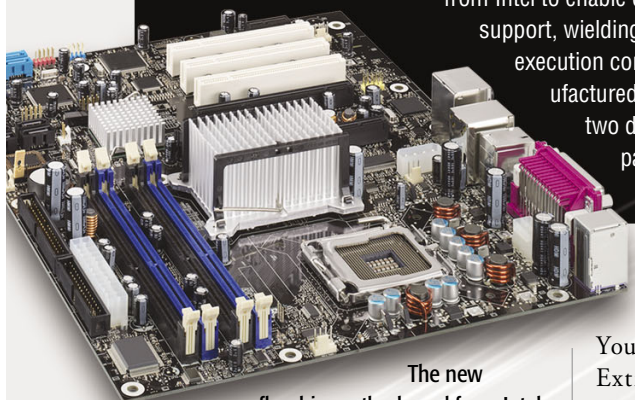
support EM64T, Execute Disable, and Hyper-Threading. For those of you keeping track, such a dual-processor configuration would boast the ability to handle eight threads. Set for release in the first quarter of '06, Dempsey will run on Blackford or Greencreek, server and workstation chipsets with improved power management, Intel I/O Acceleration, virtualization, Active Management Technology, and a new gigabit networking engine. Both platforms will introduce dual, independent FSBs to avoid glaring I/O bottlenecks.

Paxville sits one rung up the server/workstation hierarchy with support for up to four dual-core processors. This one will actually employ today's 90nm node and emerge in the same Q1 '06 time frame. Armed with Hyper-Threading, EM64T, and Execute Disable, Paxville may resemble Dempsey in many ways (exact L2 cache configurations are still unknown), including the dual FSB. Intel's E8500 chipset will somehow contend with the massive traffic generated by four dual-core processors, each enabling four threads.

The Xeon MP family will make its transition to 65nm later in 2006 with Tulsa, followed by Whitefield in 2007. Intel clearly recognizes heated competition from AMD's Opteron and is preparing for an intense battle.

Of course, AMD is determined to keep a step ahead. Part of that strategy seems to be maintaining more secrecy than Intel. For example, the San Diego and Venice desktop cores, slated to launch in 1H '05, silently emerged as little more than the Revision E chips with SSE3 support. The existing Athlon 64 X2 processors are really branded Toledo designs. Frustratingly enough, not much else is known for certain in desktops. Leaked roadmaps suggest the development of an M2 socket interface to accommodate the Windsor, Orleans, and Manila cores. Orleans (single core) and Windsor (dual-core) are said to support Presidio security technology and Pacifica virtualization, along with a revised DDR2-667 memory controller.

The mobile and enterprise markets don't look like they'll see much activity in the coming months. After all, the dual-core Opteron processors are still brand new and literally unrivaled in their class. AMD's Turion 64 recently debuted at 90nm and there aren't any apparent plans to switch to dual-core just yet. AMD says that the Athlon 64 X2 in a DTR role can satisfy any immediate need for mobile dual-core. ▲



The new flagship motherboard from Intel features a 955X chipset, supports DDR2-667 memory, and recognizes 3Gbps hard drives.

3.2GHz, is still far better than what you'd expect from a faster single-core processor.

And if executing two threads at a time doesn't impress, the Pentium EE

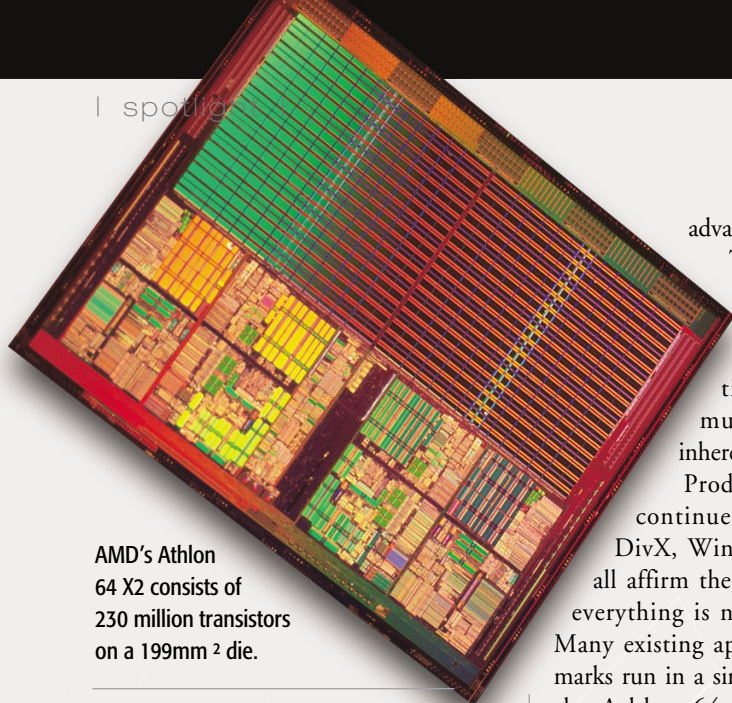
840 operates on up to four threads simultaneously through careful implementation of Hyper-Threading. You lose the compelling price point (all Extreme Edition chips cost \$999 per Intel's latest schedule), but the combination of two physical cores and two logical cores helps ensure the most efficient utilization of available processing resources.

Characterize Performance

It's truly intriguing that two manufacturers can design, launch, and ship

hardware in such tight temporal proximity. That the products are so similar in dimension and composition is also pretty remarkable. Thus, it's a little surprising that the performance characteristics of each architecture differ drastically. Perhaps it should not be given each processor's respective price inflection. However, past face-offs effectively foretell how this altercation ends with chilling accuracy.

When the Athlon 64 first hit shelves, an integrated memory controller and 1MB cache helped catapult AMD to the top



AMD's Athlon 64 X2 consists of 230 million transistors on a 199mm² die.

of virtually all game benchmarks. According to Doom 3, Half-Life 2, the AquaMark 3 demo, and Futuremark's synthetic 3DMark tests, a dual-core Athlon 64 X2 4800+ at 2.4GHz is decisively better than the Pentium EE 840. Of course, it's worth pointing out that as you push resolutions higher and enable eye-candy features, the emphasis on processor performance slowly dwindles. Doom 3 provides a perfect example. Half-Life 2, on the other hand, employs an advanced software physics engine that takes a toll on available clock cycles. Even with antialiasing and anisotropic filtering enabled, the Athlon 64 X2 demonstrates a sizable

advantage at 1,600 x 1,200.

Then again, modern games are still executed in a single thread and consequently unable to utilize multithreading benefits inherent to these processors.

Productivity-oriented tests continue to favor the X2. Dr. DivX, WinRAR, and PCMark04 all affirm the game results. But not everything is necessarily as it seems. Many existing applications and benchmarks run in a single thread. Comparing the Athlon 64 X2 4800+ to Intel's Extreme Edition 840 in such an environment fails to harness either architecture's potential power.

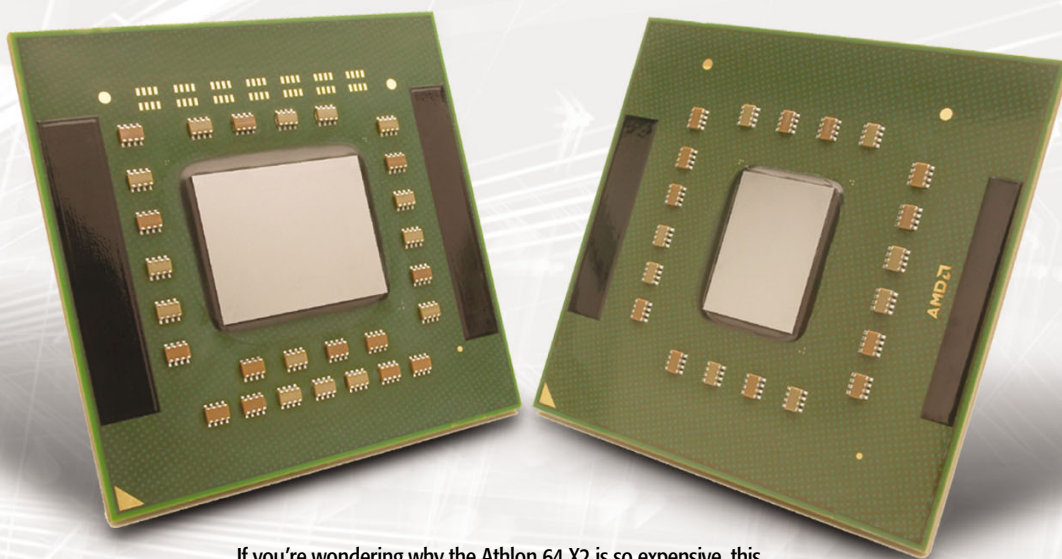
Software Caveat

As a general rule, hardware serves to enable software. Months might go by before one follows the other, especially in the world of graphics. However, AMD and Intel are both working with developers to properly utilize the potential of multiple processing cores. AMD's Developer Central (developer.amd.com) hosts plenty of useful information about the Athlon 64 X2 along with multicore white papers. Intel has its own Threading

Enabling Program to support the initiative. "Threading enabling will continue to be a major focus at Intel to more expediently enable the industry's move to greater parallelism," says Austin.

For the time being, there are already a handful of mainstream titles optimized for multithreaded execution, mostly in video encoding and photo editing. Rendering software and professional workstation programs qualify, as well, but they're hardly what you'd find on an average desktop. Dr. DivX reportedly makes light use of multiple threads, and perhaps that's why the AMD and Intel chips actually perform within a tighter margin of each other. WinRAR doesn't, though. Neither do most Web browsers, email clients, and office productivity apps.

Therein lays the big dual-core caveat. In order to see a palpable gain today, your software will need to recognize and exploit the hardware's capabilities. Fortunately, there's more than one way to skin this proverbial cat. You see, desktop dual-core processors will also improve usability when you're multitasking. Each independent core is able to handle a different application with dedicated processing resources, smoothing the transition as you switch between each. The end result is even more powerful than Intel's Hyper-Threading.



If you're wondering why the Athlon 64 X2 is so expensive, this comparison between single-(right) and dual-core (left) 90nm processors illustrates the sheer size increase necessitated by adding another core.

CPU Chart Procs

Better efficiency and an elegant architecture give AMD's Athlon 64 X2 4800+ the advantage it needs to best Intel's Pentium Extreme Edition 840.

Motherboard Manufacturer	Intel	ASUS
Motherboard Model	D955XBK	A8N-SLI Deluxe
Processor Manufacturer	Intel	AMD
Processor Model	Pentium Extreme Edition 840	Athlon 64 X2 4800+
Frontside Bus (MHz)	800	200
Multiplier	x16	x12
Voltage	1.4	1.4
Video Card	ATI Radeon X800 XT	ATI Radeon X800 XT
Video Card Driver Version	Catalyst 5.6	Catalyst 5.6
PSU Manufacturer	PC Power and Cooling	PC Power and Cooling
PSU Output	510W	510W
PCMark04	5834	6963
PCMark04 CPU	5905	6903
PCMark04 Memory	5182	4710
PCMark04 Graphics	7721	7575
PCMark04 HDD	4491	1
3DMark03	11883	12154
Fill Rate (Single Texture)	2801	2799.6
Fill Rate (Multitexture)	6630.4	6629.7
3DMark05	5553	5889
Fill Rate (Single Texture)	3285.9	3288.5
Fill Rate (Multitexture)	7955.6	7934.4
Dr. DivX (min:sec)	13:27	13:07
WinRAR (min:sec)	4:59	4:02
Doom 3 1,024 x 768	87.8	99.1
Doom 3 1,600 x 1,200	55.2	55.5
AquaMark3 GFX	9,837	10,833
AquaMark3 CPU	9,498	10,197
AquaMark3 Score	64,808	70,753
Half-Life 2 800 X 600 no AA/AF	71.05	97.74
Half-Life 2 1,280 x 1,024 no AA/AF	71.21	94.68
Half-Life 2 1,600 x 1,200 F 4xAA/8xA	68.76	79.93

Unfortunately, it's difficult to quantify such subtleties with benchmark numbers. The real story here is that the passing of time will see more threaded software, test metrics included. Dual-core hardware will continue overtaking single-core

AMD had the foresight to develop Socket 939 with dual core in mind. Any corresponding motherboard will accept an Athlon 64 X2 after a simple BIOS upgrade.

performance, despite the compromise in price and clock speed.

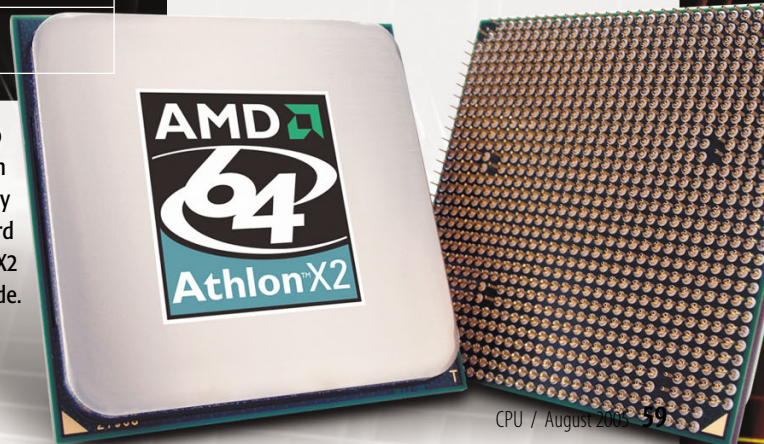
In Retrospect

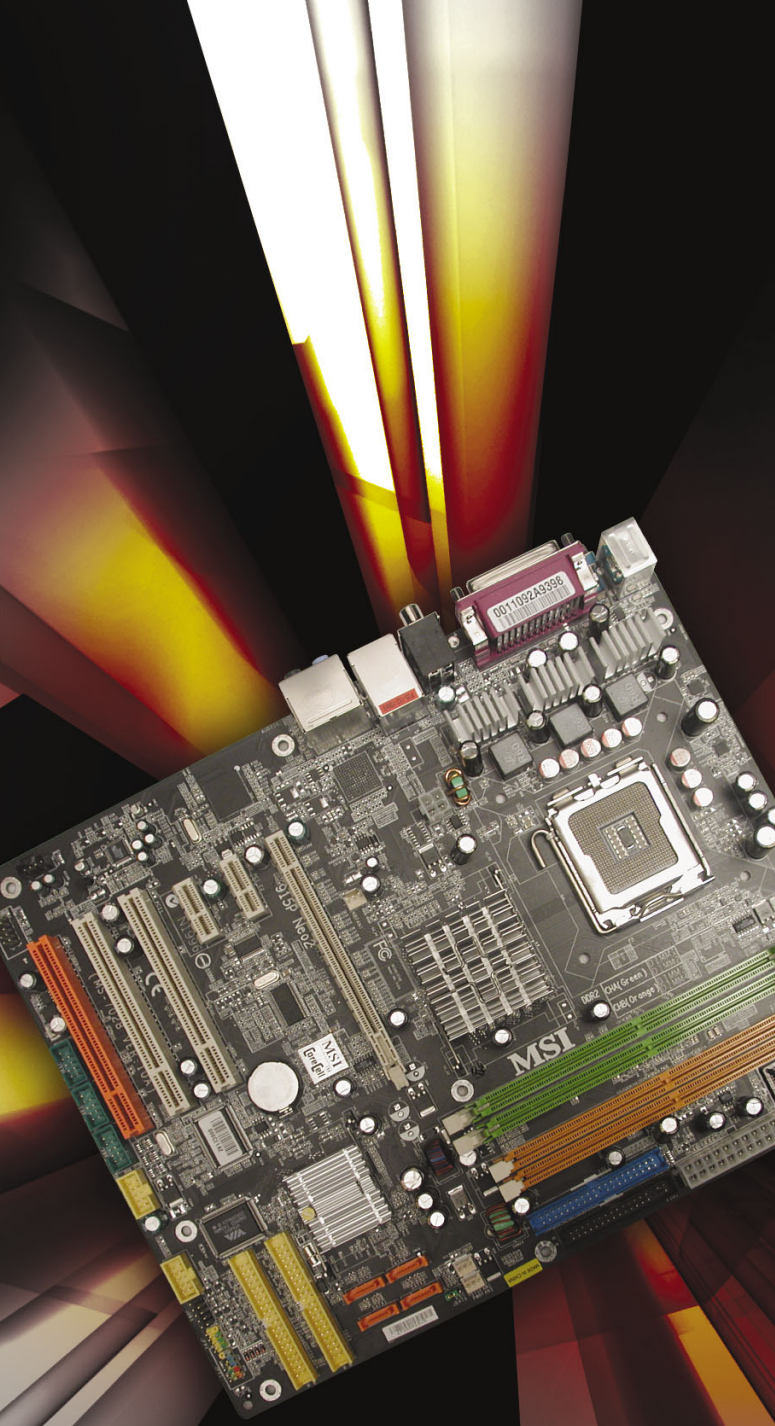
These first examples of retail dual-core hardware don't necessarily paint the most flattering picture of threaded performance using existing metrics. Multitasking benefits are there, though, and programs such as Windows Media Encoder 9 show a tremendous gain vs. competing single-core processors. AMD's confidence in the Athlon 64 X2 resonates in its new model numbers, which supersede the vanilla Athlon 64. Meanwhile, Intel's playing the economy card by selling Pentium D processors at attractively low prices. The performance victor here is unquestionably the X2. But Intel's dual-core mainstream allure isn't to be ignored.

Granted, neither AMD nor Intel is ready to give up existing single-core designs just yet. Until the software landscape changes considerably, AMD plans to continue releasing new single-core Athlon 64 FX models at faster frequencies. Intel even says it'll unveil a 65nm chip with one core to run side-by-side with its dual-core Presler design. Clearly, there's still a lot of perceived life left in less expensive single-core alternatives capable of running higher frequencies.

Moving forward, however, there's little doubt that parallelism will only increase. The Extreme Edition 840 already juggles four threads at a time and Intel's Austin postulates that processors will deliver eight threads as we approach the end of this decade. That should give software developers plenty of time to get their feet wet writing threaded games. ▲

by Chris Angelini





MOBO MANIA

Early Boards
For All Those
Dual-Core Threads



t last! The days of dual-core processors are here, and with them a first crop of chipsets ready to put those multiple threads to use. By now, you're up to speed on the chipsets, so we'll jump right in to see what the first harvest of boards sporting those chips offer.

How We Tested

Although our cover story's theme is dual-core-compatible core logic, our test bed was primarily based on two single-core CPUs, Intel's Pentium 4 3.73GHz Extreme Edition and AMD's Athlon 64 4000+. The majority of applications in our test library are still single-thread, so we aimed to avoid performance penalties and went for speed. By year's end, we expect conditions will have changed, and it will make sense to primarily feature multithreaded tests rather than confine dual-core testing to a sidebar.

For memory we chose 1GB dual-channel sets of OCZ PC3200 EL Platinum Rev 2 (2-2-2-5) and OCZ PC2-5400 EB Titanium (4-2-2-8). These represent the newer low-latency parts found on performance boards that will often make inferior quality boards hiccup and blue screen. We also use a PCI Express ATI Radeon X850 XT 256MB, OCZ PowerStream 520W PSU, Windows XP SP2, and Hitachi Deskstar and Maxtor DiamondMax SATA drives on which we built images for each respective chipset. The only test we used that this drive variance affects is PCMark04, so although it's accurate to judge HDD performance from board to board within the same chipset group, you shouldn't compare PCMark HDD scores from different chipsets.

Intel 955X (Glenwood) Chipset

Finally, Intel's latest flagship desktop chipset breaks the pattern found in the 925/915 and 875/865 generations, namely that there was little to no significant performance difference between the high-end and mainstream core logic offerings. This time Intel promises some memory enhancements on the higher-end part called Intel Memory Pipeline Technology, which "enables higher utilization of each memory channel." Glance at our PCMark04 memory scores and the difference is obvious. You don't see the benefit on synthetic graphics tests, but there's a nudge in favor of the 955X in our gaming scores, and the WinRAR compression results also favor the 955X.

If you have the extra grand to invest, the 955X is your only option for running quad-thread Extreme Edition CPUs. The 955X also offers some management benefits to corporate users, but for enthusiasts we're just happy to see Intel delivering more bang for the extra chipset bucks. Of course, if your apps don't lean on memory performance, the 945 chips make more sense. We should note that several 955X models, including Intel's, had inordinately long boot times.

Does Dual-Core Deliver?

Just for giggles we grabbed a handful of the motherboards we tested and reran the benchmark tests with dual-core processors in place of our standard CPUs. We didn't expect to be impressed, and we generally weren't. Most apps here aren't multi-threaded—PCMark04 is an exception—and the benefits of dual-core seem hit and miss. We've provided a sampling below.

Now, pitting a 3.73GHz Extreme on a 1,066MHz bus against a 3.2GHz Extreme dual-core on an 800MHz bus using only single-thread applications is hardly a fair fight for the dual-core. Still, it's odd that the dual-core showed no benefit on Intel's D955XBK while yielding a decent jump on the

ASUS P5ND2-SLI. More telling is the juxtaposition of our standard Athlon 64 4000+ against the dual-core X2 4800+, both of which run at 2.4GHz. On the ASUS K8T890 board, there's no dual-core benefit, while the jump on Albatron's nForce4 SLI (AMD version; see our Web review, www.cpublog.com/cpublog05/mobos) is huge. Whatever NVIDIA did to support dual-core, it clearly leads the field.

Traditional benchmarking doesn't apply when assessing board and chip performance. We need a new breed of multi-thread benchmarking applications and multitasking methodologies to demonstrate what dual-core is really capable of. Expect us to circle back once those pieces are in place. ▲

Motherboard	Halo		Half-Life 2		PCMark04					Dr. DivX
	1,280x1,024 no AA/AF	800x600 no AA/AF	1,280x1,024 4XAA/8XAF	1,280x1,024	System	CPU	Memory	Graphics	HDD	
ASUS P5ND2-SLI w/3.2GHz Pentium EE 840	72.58	68.73	68.02	64.3	6475	6192	5361	7560	4844	15:01
Intel D955XBK w/ 3.2GHz Pentium EE 840	100.95	66.26	65.36	61.96	6050	5672	5159	6754	3699	Wouldn't activate
ASUS A8V-E Deluxe w/2.4GHz 4800+ dual-core	33.48	84.96	89.18	75.44	4379	3927	locks	7266	1194	20:02

ABIT AW8-MAX

Wow. ABIT proves that it can still make a killer motherboard stuffed tighter than a Tokyo commuter train with features—and do it without the Fatal1ty branding. Study those benchmark scores a little closer. ABIT treads water in the synthetic tests but cuts loose on actual gaming benchmarks. We had to double-check the Halo score to be safe, and ABIT scoops ASUS in Half-Life 2. Perhaps part of the story is that AW8-MAX was one of few boards to run our OCZ Platinum DDR2 remotely close to rated spec by default. According to the BIOS, the board ran our RAM at 4-3-3-6, decidedly

better than most boards and good news for low-latency module buyers.

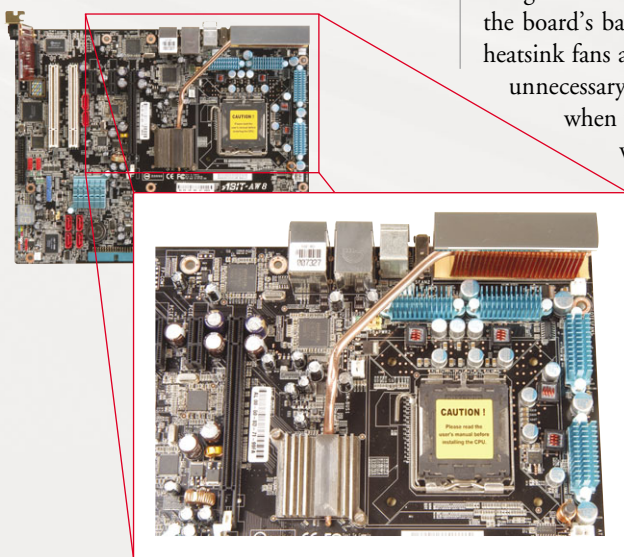
Some of the board's value-adds are of debatable real-world worth, but they're slick to ogle and brag about. For example, do the copper strips built into the PCB under the CPU's power circuitry really help the board avoid heat-related crashes? Hmm. Is this a "digital video-editing platform" because it includes 1394b and USB 2.0 ports? Does the AudioMax 7.1 daughter card really deliver less noise than an integrated port? On paper, sure. We are actually fonder of the heatsinks on the MOSFETs and the very cool Silent OTES heatpipe rig that links the north-bridge heatsink to a copper exchanger on the board's backplane. Good northbridge heatsink fans are pretty quiet (albeit often unnecessary), but why be pretty quiet when you can be silent, especially when you have (and count 'em) seven auxiliary fan headers?

We won't rehash all the benefits of ABIT's uGuru overclocking technology. Suffice it to say that this is a strong, if not exhaustive, overclocker. We wonder why ABIT elected for two rather than four additional ports off the second SATA RAID chip, but the comparatively reasonable price makes amends. This is one of the longest ABIT home runs we've seen in a long time.

ASUS P5WD2 Premium

Perhaps we'll call it the battle of the bennies. The top-tier desktop boards always seem to duke it out on the basis of gee-whiz features and accessories rather than solid benchmarks and stability, and ABIT and ASUS are the reigning rivals on this front. As usual ASUS rules our synthetic benchmarks and gave us no trouble. This 955X design uses only passive cooling for its components, lacking ABIT's heatpipe but not needing it.

ASUS' biggest glamour point here is its Wi-Fi-TV card, a combo 802.11a/b/g and TV/FM tuner combined with an IR remote and CyberLink's PowerDirector and PowerCinema apps. PowerCinema is no MCE or even SnapStream, and seeing a low-end multimedia package kludged into a high-end board seems wrong. However, bargain basement TV cards start at about \$30 and dual-band wireless



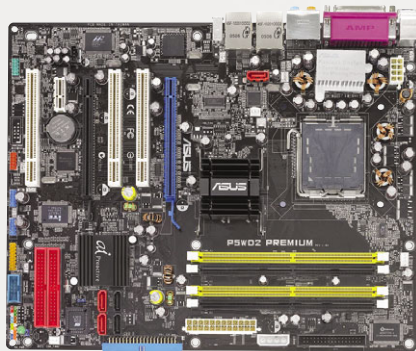
AW8-MAX

\$230

ABIT

www.abit-usa.com





P5WD2 Premium
\$279
ASUS
usa.asus.com
   

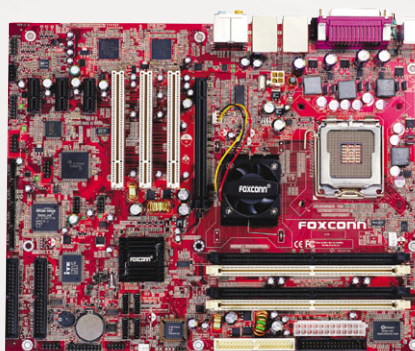
NICs at about \$70. Even if you toss the software, it's a great deal.

We didn't test synchronous 1GHz bus performance in this roundup, but the P5WD2 Premium can handle the extremely rare (as of today) ability to run at 1,066MHz on the memory and CPU buses, provided the memory can survive at that speed. This is also a remarkably robust overclocking board, with preset modes reaching up to 30% above default, although you can easily exceed this even with air cooling, provided you have enough overhead in your components. The NOS (Non-delay Overclocking System) BIOS option can also automatically determine your optimal OC settings based on one of three sensitivities you select, which is about the closest thing we've seen to nTune this side of an nForce chipset.

ASUS follows suit behind Intel by planting two x16 PCI-E slots on the board and throws a ribbon-based SLI bridge in the box, although SLI only works on the nForce4 SLI chipset and CrossFire uses an external bridge. Other notables are dual Gigabit LAN, one external SATA connector (its RAID-ready twin sits rather oddly behind the USB/LAN risers), two RAID-enabled PATA connectors, and a full complement of HD Audio ports, although 1394b is absent.

Foxconn 955X7AA-8EKRS2

Foxconn returns with another solid showing. The company has upgraded its



955X7AA-8EKRS2
\$190
Foxconn
www.foxconnchannel.com
  

packaging to a hard-walled, textured casing, but inside is the same red Foxconn PCB with black cabling. There are no wireless or heatpipe gewgaws here. Foxconn wanted to win on price in the 955X category without looking or running cheap, and that's what this board achieves.

At only \$190 the 955X7AA makes an excellent storage server board, boasting a full set of four secondary SATA ports on a Silicon Image RAID chip adjacent to two more PATA headers downwind of an ITF RAID chip. You still get a full HD Audio port selection, and there are three FireWire (one 1394b) headers on the board. Overclocking capabilities are sufficient for most dabblers and dual Broadcom Gigabit Ethernet is a plus, but our favorite feature is SuperRecovery, the built-in disaster recovery app. It lets you specify a certain percentage of the primary hard drive to be hidden, meaning invisible to the OS (and hackers). Should someone or something trash your drive, you can go into the BIOS and use SuperRecovery to reinstate your saved image. This isn't a practical tool for data backup, but it's an awesome time-saver for reinstalling Windows and your core applications.

Foxconn elected not to implement the dual-graphics architecture, which seems a pity if only because it cuts off an easy path to triple- or quad-head displays. Still, the 955X7AA is a great, stable buy for those wanting the 955X's core benefits without a lot of toys attached.

Gigabyte GA-8I955X Royal

As much as we like to poke fun at gimmicky motherboard additions, we understand manufacturers' predicament. Most people looking to buy a motherboard for an Intel processor will probably pick an Intel motherboard, unless they have a good reason not to. Hence, the gaudy bundles that we see so often here. Still, gaudy practical is good; gaudy impractical isn't.

At heart the GA-8I955X Royal is a practical board. It turns in average to above-average benchmark scores and toasted the competition on our WinRAR test. The Realtek ALC882M audio codec is here, the same chip ABIT's 955X and other top-rank boards now use for best-in-class, integrated HD Audio. You get a 1394b header, dual GbE, coax and optical SPDIF, and bonus RAID via two extra SATA ports and two additional PATA connectors. So far so good.

Then come the add-ons. First up is a cheap-looking northbridge clip-on fan. If the board needs a fan, put on a quality quiet one from the outset. Next, the U-Plus DPS power unit doubles the power to the CPU from four-phase to eight-phase, ostensibly to provide for stable voltage in the face of fluctuations to help prolong component life. Gigabyte has never shown us any objective proof of this concept, and we've never measured an onboard fluctuation even close to falling outside of Intel's comfort margin when using a quality PSU.



GA-8I955X Royal
\$239
Gigabyte
www.giga-byte.com
  

Lastly, Gigabyte includes a Bluetooth dongle. We like Bluetooth, but it just seems an out of place item here.

Taking these items away, we're left with a decent performing board you can tweak a fair amount that's about \$40 overpriced.

Intel D955XBK

Traditionally, Intel boards have been middle-of-the-road performers, impressing more with stability than speed. Intel veered into the enthusiast market a bit with the 925X's Extreme Series, and we hope to see that return in this generation, but the D955XBK is a return to Intel's proven formula: Run in the middle of the pack and never fall down. Scores across the board were entirely average, and if you don't post benchmark results in your forum signature, average is just fine.

There are some unexpected extras here, though. Intel retains its recent embracement of FireWire but takes the next step by supporting 1394a and 1394b (via header extension). Four extra SATA ports spool from a Silicon Image controller, you get SATA/300 plus NCQ support, and the SigmaTel audio chip feeds 7.1 HD Audio analog jacks and coax and optical SPDIF out ports. Be warned, however, that the ATX12V connector is of the 8-wire variety, not the normal 8-wire. Fortunately, our OCZ PowerStream PSU came prepared for this, but most power supplies don't.

The best upside here is the second full-length PCI-E slot, which can configure as either x16 or x4. According to ATI, this Intel implementation will be compatible



D955XBK

\$230 (projected street price)

Intel

www.intel.com



with the new CrossFire dual-slot graphics architecture, which puts a whole new spin on whether or not this unit's gaming performance is average or not.

Intel 945P/G (Lakeport) Chipset

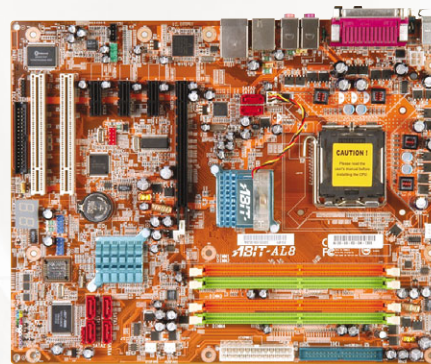
If you don't care about dual graphics and Extreme Edition dual-core chips, the 945 platform looks pretty attractive, especially if you just need Intel's basic integrated graphics to start with before upgrading to a PCI-E card later. You still get the ICH7R southbridge and all the goodies that go with it. On the northbridge the 945 has one edge over its 955X cousin: support for a 533MHz system bus, in addition to 800MHz and 1,066MHz. (Contain your excitement.)

Intel 945P/G-based boards were just starting to land in America as we went to press, so more stripped-down, budget-oriented designs may follow. But this first minicrop we examined was surprisingly stacked with features. Perhaps this is a sign that Intel wants to keep the 945 generation at the upper-end of the mainstream segment and leave the 915 more time to fend off the likes of ATI and VIA.

ABIT AL8

ABIT promotes the AL8 as an AV platform, and this seems like a great use for the board. The Realtek ALC880 chip lacks some of the sonic subtlety you'll find with the AW8-MAX's ALC882M, but it still belts out admirably clear 7.1 audio along with jack sensing and optical SPDIF in and out ports—an uncommon perk for those wanting to import and encode from a home audio receiver, not just send to it. For video ABIT showed its usual flare for excelling in benchmarks, managing to eke out victories in most of our graphics-intensive tests. In all fairness this may have been due in part to the board's defaulting to a 272MHz bus speed (3,808MHz effective). Then again memory timings automatically set to 4-4-4-6.

The AL8 provides the performance essentials, including ABIT's uGuru firmware and software, a secondary 3Gbps SATA RAID controller (two ports), and Intel's ICH7 southbridge. FireWire (1394a) comes on the backplane



AL8

\$175

ABIT

www.abit-usa.com

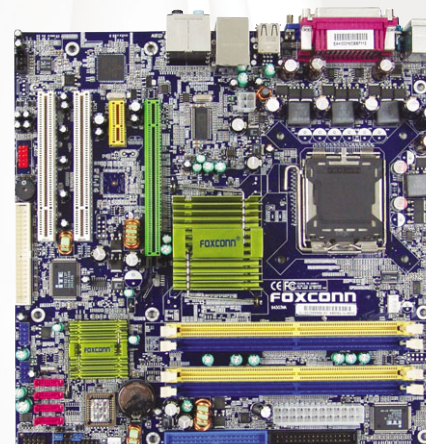


and one header, but there's no 1394b. Similarly, you only get one Gigabit LAN port. Watch out for the preinstalled northbridge fan, which blows sideways toward the CPU. The fan stands taller than most heatsinks, and while it was no problem for our Intel reference unit, larger heatsink fans may run into it.

Overall, we'd have liked to see the AL8 cost a pinch less, but it definitely earns its price tag.

Foxconn 945G7MA-8KS2

This is a tough one. Our IGP-enabled Foxconn board did well through all tests, save one: the HDD test in PCMark04, in which the results were half of what we



945G7MA-8KS2

\$140

Foxconn

www.foxconnchannel.com

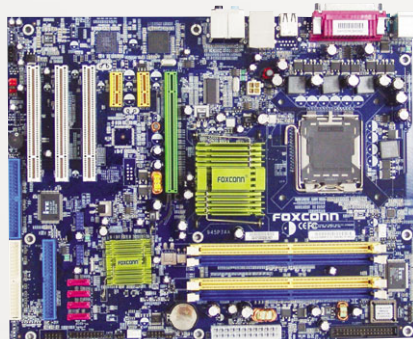


expected. This proved a repeatable result but not one specific to Foxconn. Intel repeated it in that D945GTP's IGP tests, and even ASUS bottomed out on that test in the 955X category. We are more inclined to suspect the application as a cause than the boards.

So we are left with a good performing microATX board set up for 7.1 analog output (one coax SPDIF header onboard), integrated graphics, Gigabit LAN, and that sweet SuperRecovery feature. Yet, there's no 1394 and no RAID, and this left us wondering: What separates this Foxconn from a conventional 915G board? Dual-core compatibility, SATA/300, and roughly 50% faster IGP performance? We do wonder how many productivity workers or consumers looking for low-end secondary PCs that will sway when \$60 separates the two. Some, no doubt, but despite this motherboard's merits, Foxconn needs a good value-add bundle to make the 945G7MA stand up and salute. Alternatively, newer Foxconn models ending with -8EKRS2 add the FireWire and ICH7R back in for only \$10 more. We'd encourage you to go that way.

Foxconn 945P7AA-8KS2

Second verse, same as the first, only now in a standard ATX board with no IGP. To replace the value of the missing IGP, Foxconn adds two additional PATA ports and an ITE RAID controller. Given that some analyst estimates have PATA being fully obsolete by the end of 2006,



945P7AA-8KS2

\$140

Foxconn

www.foxconnchannel.com



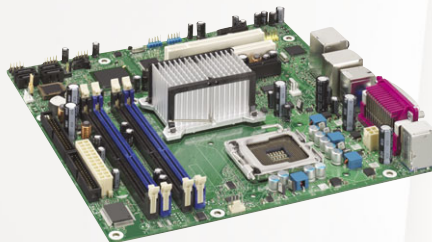
we have to assume that the feature is aimed at users bringing old drives forward onto new platforms.

It's worth pointing out that this comparison of two 945 boards by the same vendor illustrates a break with previous Intel chipset generations. Since the 865P and 865G, the P chipsets have outperformed their IGP counterparts by 2 or 3%. That delta is now gone, and good riddance.

Intel D945GTP

We received our D945GTP as part of a reference kit promoting the release of the Pentium D, so it's a fair guess that this board owns the feature set Intel considers ideal for the upper-mainstream: single PCI-E slot, four DDR2 slots, 1394a, HD Audio (with the SigmaTel 7.1 codec), the GMA950 graphics core, and a tidy micro-ATX form factor well-suited to living spaces. There's no heatsink on the south-bridge, but the "SATA II"-ready part still offers Matrix RAID, something that should be a must-have for everyone with important data but few drives.

After seeing the Foxconn unit, there isn't much to add here. Intel is only a half-step behind in the IGP test scores but keeps a half-step lead when running with discrete graphics. The overclocking tools of the D955XBK, especially those present when running an Extreme Edition chip, are almost entirely gone here. Intel promotes the D945GTP as part of the "Digital Home," but we think this board will be more comfortable at work.



D945GTP

\$138 (projected street price)

Intel

www.intel.com



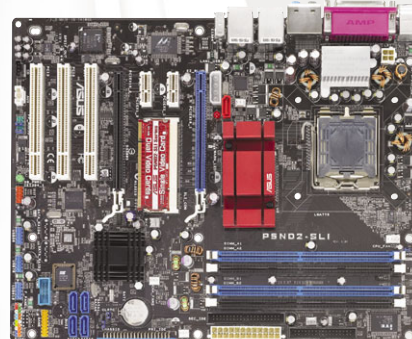
NVIDIA nForce4 SLI Intel Edition Chipset

Much anticipated, NVIDIA's foray to the Intel side doesn't disappoint. A comparison of test results between the SLI Intel Edition and the 955X shows the chips neck and neck on performance. Intel may have taken the lead on audio with its latest HD implementation, but NVIDIA clearly offers the more innovative and feature-rich driver package courtesy of ForceWare. Ultimately, deciding on which chipset to adopt may depend on whose dual-slot graphics technology you prefer.

ASUS P5ND2-SLI

ASUS continues to amaze with its engineering and ability to pull performance from thin air when it puts its mind to it. (Of course, it takes a half dozen BIOS updates to get there.) Our test results tell the story. ASUS wrings more from hardware, whether it is through using superior components or digging down to CL1 timing support. The P5ND2-SLI aims to be a fraternal twin of the P5WD2, showing the same external SATA port, dual GbE, overclocking options, and wealth of audio jacks, although 1394b and PATA RAID is missing. A digital SLI switch instead of a selector card would also be nice.

We experienced one bit of weirdness here. When we got our system running, it would lock shortly after booting. The BIOS revealed that even at idle the CPU was roasting at 62 degrees with a 3,900rpm fan speed. (About 2,500rpm is normal.)



P5ND2-SLI

\$249

ASUS

usa.asus.com



We swapped out for the slowest 4-4-4-12 we had, which fixed the problem. We then swapped for low-latency Corsair, which still worked, then popped our original OCZ sticks in and the system ran fine. Whatever. The board still rocks like no other.

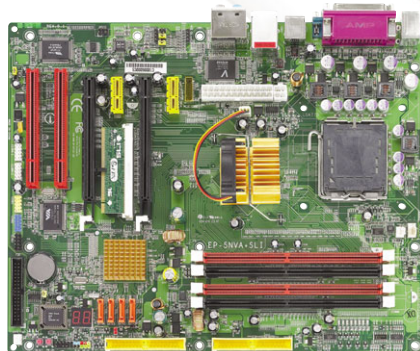
EPoX 5NVA+ SLI

The coolest feature in this roundup is EPoX's Pulse-XT memory throughput LED indicator; it's much like the indicators on Corsair Pro and Xpert modules, only downsized and hard-mounted to the mobo PCB just above the DIMM slots. If you overclock or do much benching, the indicator is invaluable, and the onboard power and reset buttons placed in one corner is a close second. We're not sold on placing the ATX and 12V power connectors between the side-blowing northbridge NSF and the 7.1 audio/GbE LAN/USB risers. Having both SPDIF-out ports on the backplane is good, and the swiveling lock on the SLI selector card is clever.

Apart from the four SATA/300 ports the SLI chipset fuels, there are no other drive ports or RAID functionality. EPoX throws in a goody bag (literally) with RAMsinks and a screwdriver, but that takes us back to silly package add-ons. This board performs well, makes good use of the gifts NVIDIA gave it, throws in some nifty tweaker features, and has a very fair price.

Gigabyte GA-8N-SLI Pro

If we whined about the unnecessary extras on the GA-8I955X Royal, Gigabyte



5NVA+ SLI

\$219

EPoX

www.epox.com

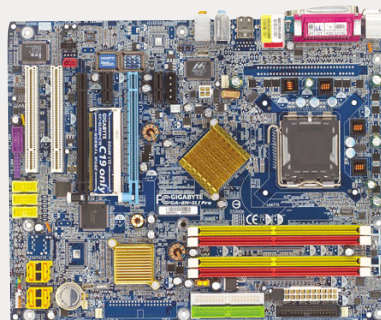


obviously had people like us in mind with this SLI Pro edition. The extra PATA and SATA ports, plus their RAID controller, have disappeared, and there's a breath of fresh air where the dual-power slot used to be. Even the memory timing options have vacated (although there are odd new tidbits to play with, such as SATA II voltage). We're down to the essentials here—almost. There are three USB 2.0 headers to complement the four ports already on the backplane and one each of 1394a and b headers. The LC850 codec feeds six analog jacks, plus coax and optical output.

In our tests the board is on cue with the nForce4 script, save for it blasting inexplicably ahead in Halo and stumbling in Half-Life 2. The GA-8N-SLI Pro is a pleasantly frill-less workhorse that will serve users wanting SLI power on a relative budget.

MSI P4N Diamond

Except for a Halo hiccup, this board turned in a solid, error-free showing, running our 4-2-2-8 modules at 4-3-3-12 but



GA-8N-SLI Pro

\$249

Gigabyte

www.giga-byte.com



holding up well. Our only complaint is the height of some CPU capacitors crowd two heatsink clamping pins, making them hard to twist. MSI obviously put a lot of thought in as to how it could differentiate this board from its competitors.

The board uses a digital SLI switch, so there isn't a card to flip. Two more SATA RAID ports sit beside the first four, MSI's CoreCell overclocking chip is ready for duty, and (for overclockers) a CMOS Clear



P4N Diamond

\$259

MSI Computer

www.msicomputer.com



button rests by the SATA ports. Equally impressive is the integrated audio chip, a 7.1 HD Audio Sound Blaster Live! 24-bit with 100dB signal-to-noise ratio that's clearer than what most integrated codec chips have. It's not quite the nForce SoundStorm of old, but in some ways it's better. MSI adds full audio port selection, two 1394a headers, one 1394a port, and many software utilities—one can configure a wireless NIC to be an access point.

ATI Radeon Xpress 200 (RS400) Chipset

Having already seen ATI's AMD-based "Bullhead" reference board (January *CPU*, page 17), there weren't many surprises here. Unfortunately, we were only able to land one benchmarking-ready production motherboard using this chipset for testing.

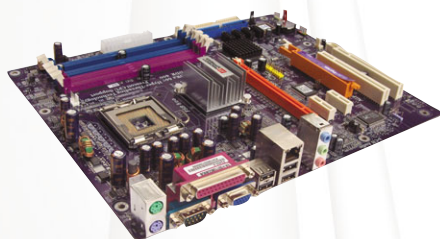
ECS RS400-A

To answer the big question, our numbers show the Radeon Xpress 200 runs a few points behind its Intel 945P counterpart. ECS told us that was intentional. The company is in the midst of trying to remake its public image, and it would rather be a bit slow than buggy. For more speed, several overclocking tools are buried in the BIOS, including the Adjust DRAM Timing screen. But these aren't the usual CAS, RAS, etc. items you're used to. Instead, you get options for such things as LAQ Bypass and Impedance Control, and the manual is oblivious to explaining such things. You can adjust the major voltages, step the CPU up to 510MHz, and apply a

percentage overclock to the memory of up to 31%. Why 31 instead of 30%? Sometimes you need a little push over the cliff.

ATI has roughly doubled the integrated graphics performance from its prior part, the Radeon 9100 IGP, which makes good positioning sense for ATI. After all, no one buys a \$90 board to run a \$400 graphics card. ATI and ECS built this board to be a 945G killer, and ATI delivers nearly all the system performance with plenty more graphics horsepower for less money. ATI and/or ECS appear to have traded speed for stability, though, as our Halo crash and system reset in *Half-Life 2* showed. Clearly, this IGP does best at XGA resolution or less. Worse, while the RS400 is dual-core compatible, when we plugged in a 2.8GHz Pentium D, the board spun up for a few seconds, then died, indicating that ECS has yet to address dual-core support in its BIOS or is saddled with a premature version of the northbridge.

ECS has also done a clever job in picking its perks. Apart from an I/O shield, driver CD, one SATA cable with power adapter, and the flat ribbon cables, you get nothing besides the board—and a board fairly denuded of I/O ports at that. But the RS400-A offers one PCI-E slot, along with one AGP slot, and there are two slots each for DDR and DDR2. This makes the RS400-A a prime candidate for budget users wanting to step up into modern parts one piece at a time. We tested our Platinum DDR and Titanium DDR2 modules on the board and found the DDR trailed by only 200 points or so in PCMark04's memory test. All other numbers were quite similar.



RS400-A

\$90

ECS

www.ecsusa.com

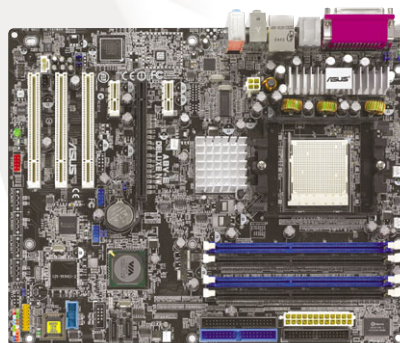
VIA K8T890 Chipset

VIA has a history of going from feast to famine and back again. VIA is right now trying to claw its way in the dual-core age one delay at a time. The K8T890 is VIA's first effort in this field, and it needs a victory to start reclaiming market share. Is the chipset the success story VIA needs? With only two samples available at press time, it's hard to decide. There's some promise here, but there's still a ways to go.

ASUS A8V-E Deluxe

We almost had a premonition of how this review would go by looking at the A8V-E. At first we thought, "Oh, nice backplane—802.11g, dual SPDIF, 1394a, 7.1 analog. Looking good." Then we saw the PCB and thought, "Who shaved off all the features?" There are only two SATA ports. Four SATA RAID slots stand empty, never mind other similar vacancies. The northbridge fan looked cheaply decorative rather than functional, but we suspended final judgment until the numbers were in.

Unfortunately, the numbers were mixed. Our XGA test in *Doom 3* was very good, but 1,280 x 1,024 in *Halo* was clearly more than the K8T890 could handle. *Half-Life 2* numbers were strong, but this board crashed repeated in PCMark's memory test. Finally, the encoding and compression tests were the worst of any board here. We see glimmers of what ASUS is capable of doing with VIA and the Athlon platform, but this board is still too immature to recommend.



A8V-E Deluxe

\$120

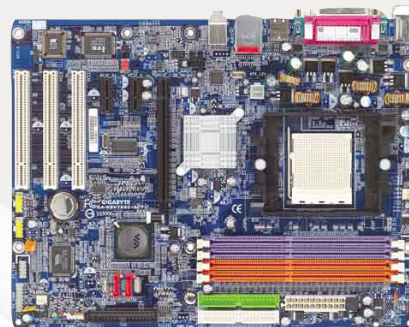
ASUS

usa.asus.com

Gigabyte GA-K8VT890-9

Our first run with this board fared far worse even than the ASUS, but a BIOS update worked wonders. The DivX encoding test is still disappointing, but the remaining numbers are often quite good considering we pitted a 4000+ against Intel's single-core flagship.

The GA-K8VT890-9 is even sparser than ASUS' board. The FireWire is gone, and even 7.1 audio is an optional add-on. (The backplane only offers three 1/8-inch audio jacks and no SPDIF.) Gigabyte looks to counter ASUS' integrated wireless by including an 802.11b/g PCI card. Because this is a solid board that can turn out some respectable dual-channel Athlon performance, the best thing might have been to supply nothing more than the shell. Ditch the Wi-Fi card and get the price point under \$100 if possible. You've still got the GbE port onboard. We tend not to get too excited about bargain-basement boards, but



GA-K8VT890-9

\$110

Gigabyte

www.giga-byte.com

if this one can get its performance tightened another notch or two, it could make for a strong secondary PC, including for gaming. ▲

by William Van Winkle

See our benchmark chart at www.cpubug.com/cpubug05/mobos. You'll also find late-model boards based on the NVIDIA nForce4 SLI chipset for AMD CPUs (see our early-model board reviews in April 2005's *CPU*, page 16) and more.

USE YOUR BRAIN

left side

right side

Portable Audio for iPods
AC & Battery Powered
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High Efficiency Digital Amplification
Wireless Remote
Built-in iPod® Cradle
Neodymium Drivers
Onboard Digital Signal Processor
S-Video Output
Universal Power Adapter
Auxiliary Input Jack

cool

BOTH SIDES



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ALTEC LANSING®
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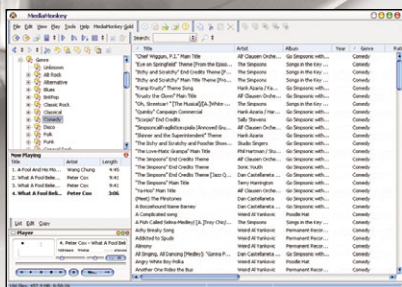
www.alteclansing.com/inmotion

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The Bleeding Edge Of Software

Inside The World Of Betas

MediaMonkey 2.4.862 RC2



Official product name: MediaMonkey

Version # previewed: 2.4.862 RC2

Publisher: Ventis Media

Developer and URL: Ventis Media;
www.ventismedia.com

ETA: Q2 2005

Why you should care: The best alternative to iTunes out there.

Like the idea of iTunes keeping track of and playing your music library but hate giving up control of the music files and directories you've spent years organizing? Looking for one app to rip and burn music? Need an easy-to-use music program full of features? Want to easily synch your portable audio player with the library on your computer? MediaMonkey is for you.

The app initially scans your media files, reads their ID3 (or equivalent) tags, and creates a comprehensive internal database. You can sort and play music by genre, artist, title, album, or era; use directories/sub-directories; and create playlists with drag and drops. Unlike iTunes, playlists are standard M3Us. Searches are lightning fast, too.

Using LAME MP3 (and other encoders), MM can quickly rip music into practically any format and bit rate, and at the maximum speed your hardware allows. If MM finds almost any version of Nero Burning ROM on your computer, it can directly burn discs utilizing Nero's DLL's.

The beta's main purpose is iPod support. With earlier versions iPod's proprietary internal database proved a tough nut to crack. With this support there are now many iPod-related options that go beyond iTunes. (There's no support for DRMed iTunes music, however.)

The shareware version is a complete package, but the freeware has plenty of features to satisfy almost anyone. ▲

iPodder 2.1 beta2

What do you get when you combine MP3s and blogs? Audioblogs, or what many people call podcasts, as many audioblogs are loaded on iPods to listen to on the go. iPodder makes collecting podcasts simple, even if you use something other than an iPod.

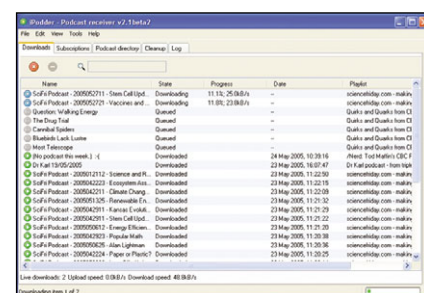
Podcasting is nothing more than collecting blogs and their attachments via RSS. You can use an RSS reader that handles attachments to save podcasts to your local drive and play them back with Winamp, Windows Media Player, etc. Apps such as iPodder, however, make the process simple by automating many aspects of keeping up with a regular audioblog.

You use iPodder by giving it URLs to podcasts or by consulting its built-in list of podcasts. iPodder downloads podcasts and descriptions and then new podcasts during

your next download session. If you use iTunes, iPodder automatically injects the podcasts into your library and automatically syncs to your iPod so you have your podcasts ready to roll. If you don't use iTunes, the files are dumped into folders and sorted by the name of the sites they came from.

iPodder can automatically check for new podcasts based on a schedule you set or manually. It can play back podcasts directly or pass them to an audio player (though you can only choose iTunes or Windows Media Player). iPodder has a high level of polish, stability, and elegance that belie its freeware status. Mac and Linux versions are available.

iPodder is simple enough for beginners but advanced enough to keep experts using it every day. iPodder may become to podcasting what Netscape 1.0 was to the World Wide Web. ▲



Official product name: iPodder

Version # previewed: 2.1 beta 2

Publisher: The iPodder Lemon team

Developer and URL: The iPodder Lemon team;
ipodder.sourceforge.net

ETA: Q2 2005

Why you should care: A new way to download and listen to audio.

Send Us Your Betas: Know of software in the beta stage that's deserving of some attention?

Let us know. We'll take a look at it and possibly give it a go-round. Send your prospects to bleedingedge@cpumag.com.

SPEED

UP TO

Upgrades That'll Keep You Humming Along

ATI and Apple grab the limelight this month. New Catalyst drivers not only add performance and features but now include drivers for ATI's portable chipsets. QuickTime now competes head on with Windows Media Player by adding high-def playback, and check out what's new with Spybot - Search & Destroy.

Upgrades

BitComet 0.59

The BitTorrent client now supports the DHT network and private keys.

Get it at: www.bitcomet.com

CloneCD 5.2.4.2

Recent versions correct previous problems when installing on Windows XP Professional x64, improve the RegCloneCD.exe program, and add MIME.

Get it at: www.slysoft.com

Eudora For Windows 6.2.3.3 (Beta)

Qualcomm's email client fixes earlier problems with hangs involving IMAP message handling.

Get it at: www.eudora.com

Morpheus 5.0.0.577 (Beta)

Morpheus gets a new GUI, improved search tools, lower CPU overhead, and faster network connections and downloading.

Get it at: www.morpheus.com

Mozilla Thunderbird 1.1 (Alpha 1)

For Windows, Linux, and Mac OS X, this pre-pre-release of Mozilla's email client adds a phishing detector, spell checking as you type, better RSS support, and the ability to delete attachments.

Get it at: www.mozilla.org

QuickTime 7

Apple claims by using the H.264 codec, QuickTime can encode/playback video for everything from 3G phone formats to full high-def movies. QuickTime supports up to 24 channels of sound, including 5.1 and

7.1 surround schemes; offers better console controls; and self-configures streaming for your Internet connection speed. A Pro version adds media creation tools.

Get it at: www.apple.com/quicktime

Skype for Windows 1.3.0.45

This iteration of the VoIP client adds a missing events panel, animated emoticons, wider language support, improved Getting Started Wizard, and contacts importers, plus voicemail subscribers can leave voicemail for any user.

Get it at: www.skype.com

Spybot - Search & Destroy 1.4

The ad/spyware buster can now scan multiple OSes on a system and scan inactive Registries. There are also significant speed improvements, new options, a more polished UI, and advanced tools.

Get it at: www.safer-networking.org

ZoneAlarm Pro 6.0.591.000 (Beta)

This version has spyware detection and prevention features, enhanced virus protection, and can kill malicious operations. ZoneAlarm also adds Triple Action Firewall, which guards against intrusion at the network, OS, and program levels.

Get it at: www.zonelabs.com

Driver Bay

AMD Athlon 64 X2 Dual Core Processor Driver 1.2.2

This version of AMD's drivers for dual-core CPUs has separate 32-bit and 64-bit versions for Windows XP and Server 2003. The drivers adjust CPU speeds and

voltages to match the "instantaneous user performance need," according to AMD.

Get it at: www.amd.com

ATI Catalyst 5.6

Updates in this major release include new Mobility drivers for most ATI chipsets running on notebooks. The Catalyst Control Center now provides a real-time preview of selected 3D options and multiple de-interlacing options. Radeon cards now get full hardware acceleration for Windows WMV video playback, a 5% bump in 3DMark05, and a 7% hike in Doom 3.

Get it at: www.ati.com

Creative Zen Micro MediaSource Plug-in 1.00.18

This package lets you synch the new Zen Micro with the PC MediaSource software and includes the Sync Manager app and an Import Wizard for moving select tracks.

Get it at: www.creative.com

Intel Chipset Software Installation Utility 7.0.0.1025

For most mobos with Intel chipsets, these drivers update the INF file for most recent chipsets and resolves previous installation problems, some PnP detection, and proper notation in the Registry.

Get it at: www.intel.com

Linksys WRT54GX 1.01.07

This upgrade for the new 802.11g router with SRX speed boosting fixes a security hole associated with remote management.

Get it at: www.linksys.com

NVIDIA Linux Display Driver - IA32

These drivers get new features, including OpenGL 2.0 support, GPU clock manipulation, and support for Quadro G-Sync.

Get it at: www.nvidia.com

Via Hyperion Pro 5.00a

These drivers have an updated AGP driver that no longer overwrites the default driver in Windows Server 2003 SP1 and includes the latest hardware information file, RAID drivers, and tools.

Get it at: www.viaarena.com

by Steve Smith

Face To Face

Instant Messengers That Do Video Chat

Video conferencing once was something only available in corporate conference rooms with dedicated hardware. Now, nearly anyone can video chat on the desktop using commonly available hardware. Cheap cameras and cheap bandwidth make this possible. You can now get a decent conference-quality video camera for around \$50 that will let you transmit a 640 x 480-sized video image around the world.

There is also an important third element: commodity software. Almost every major instant messenger program now has a video chat feature built in, often at no

program had an option to change video-compression levels.

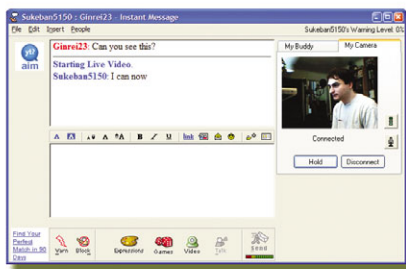
AOL Instant Messenger 5.9

AIM is easily the world's most broadly recognized chat client and is available for everything from PCs to phones to PDAs, even though its technology and protocols are highly proprietary. Versions 5.5 and up support live video conferencing through any standard Windows camera device. Video alone, audio alone, or audio and video together are supported, and you can have a one-way conversation, as well. (For example, two chatters don't

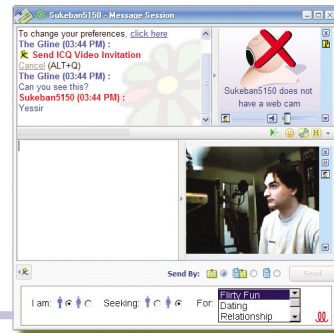
it's only available on the File Sharing/Transfer pages in Preferences.

You can establish a video connection with another user by selecting Open Video from the chat window for that user. Tabbed windows in the chat window show you and the other person and let you change basic settings, such as volume and video quality. If you're on a slow connection, use a lower quality to save bandwidth. The default is a halfway setting between maximum compression and picture quality. The slider for choosing compression isn't calibrated, however, so it's difficult to tell what the compression ratio is. Video only runs at 160 x 100 (you can't resize it), but on wireless LAN connections I got a consistent 15fps.

AIM isn't as feature-rich as other clients here, but most people who use IM start with AIM, so it might be the logical place to begin.



AIM 5.9
Free
America Online
www.aim.com



ICQ 5.04
Free
ICQ
www.icq.com



extra cost. I looked at five well-known chat programs with video conferencing and put them through their paces. Many of the programs share the same features, such as integrating virus protection and working through proxies/firewalls, so I focused on the positive differences and quirks that make them special.

For testing I used two identical Creative Labs WebCam Live! USB cameras installed on two machines running Windows XP Service Pack 2. I tested locally in a LAN and across a broadband connection because network conditions affect not only the connection quality but whether you can connect at all. Video quality varied only slightly among the chat programs, although not every

both need video or audio capabilities because you can always type text.)

AIM supplies a link to Windows' Audio/Video Tuning Wizard, but the link is a bit buried; you have to enter AIM's Preferences menu, select Live Video, and click Video/Audio Tuning. The Live Video page also contains preferences for how to restrict attempts to contact you for video chat sessions. This is a common theme in AIM, where you can be as inclusive or exclusive as you wish. AIM also has internal settings for dealing with firewalls (the bane of chat clients that depend on a live connection), but these are hidden on a subpage, and the button for summoning that page isn't even available from the Live Video page;

ICQ 5.04

Before AIM there was ICQ, which AOL owns but runs more or less independently of AIM. Many users remain fanatically devoted to ICQ, which is also one of the first and most successful Internet social-networking programs. ICQ added video chat in version 5 to its existing audio conferencing features. ICQ also supports one-way chats in the event one user has video and one doesn't.

To support video chats, ICQ uses an external RTC (Real Time Communications) component, which you need to install separately. This appears to be based on Macromedia Flash, so if it is not installed, you will be queried to add it.

When you launch ICQ and log in, users in your Online list with video capacity will have a small camera icon next to their name. Audio capacity is denoted with a separate icon. Click the camera icon and you send the user a video chat request. If she accepts by pressing ALT-A or clicking a link in a window that appears, the chat begins.

ICQ's video chat window has many more controls than AIM's, but it's also more complex and potentially confusing. Many controls for video are extremely small and scattered, and while tips are available about their functions by hovering the mouse cursor over them, they're not always self-evident. There also doesn't appear an easy way to edit the video compression level, but you can change the size of the video window fairly easy. It took some fussing around to discover that an arrow icon near the video window's

If Video Isn't Your Thing. . .

What if you'd rather not be seen? All the programs here also work as conventional text and voice chat apps, so you can always just talk or type. Another possibility is remote whiteboarding in programs such as Microsoft's NetMeeting, wherein you can share voice, video, live diagrams, charts, and pictures. In some cases this may be even more useful, and because NetMeeting is a free download for Windows, it's a convenient alternative to the more commercial IM/video programs here. ▲

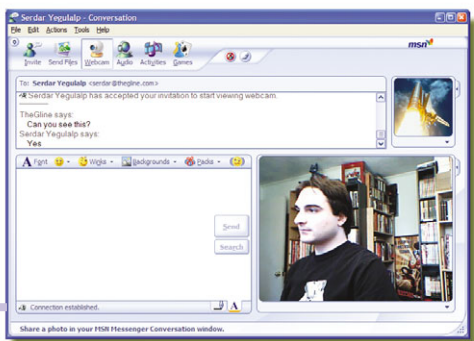
address. Once you are signed in, you can send your Web cam feed to another chatter without audio or start a video conversation. Sending a Web cam feed is a one-way visual, while a video chat is two-way (the other person needs support for video, of course).

If AIM has the simplest UI, Messenger has the next simplest. You can start a video connection just by clicking an icon in the chat window. When Messenger establishes a video connection, it runs a brief ad in the video window before

review Web search results together in the same window. I also liked the whiteboard function and that you can send SMS text messages to mobile phone users if their plan supports it.

Trillian 3.1 Pro

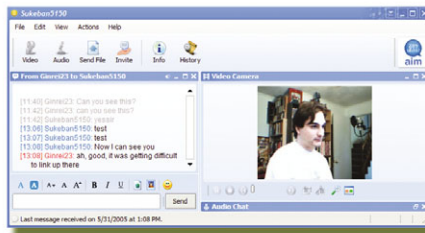
Trillian is a kind of meta-chat client. There is no Trillian chat protocol per se; the program is actually designed to work with many existing chat apps, including AIM, ICQ, Y!M, MSN, IRC, and more.



Trillian 3.1 Pro
\$25 (Free 15-day trial)
Cerulean Studios
www.ceruleanstudios.com

MSN Messenger 7

Free
Microsoft
imagine-msn.com/Messenger/Default.aspx



bottom right opened a drop-down menu that led to the Video Settings window.

People who just want to click and chat are likely to be frustrated at first, which makes ICQ's video chat probably best for people already comfortable with using the program.

Microsoft MSN Messenger 7

MSN Messenger comes bundled with Windows (and runs only on Windows), although the latest revision is available as a separate download. The version that shipped with WinXP SP2 typically didn't include video chat, so you may need to upgrade Messenger for that feature.

Messenger users need a .NET Passport account, which requires only a valid email

starting the video stream. This is annoying but not fatal. Yahoo! Messenger does something similar.

Once the stream starts, you can edit the camera's setup or picture properties via an icon. These include the camera's custom controls. If you don't need the chat window at all, you can switch to a full-screen view, although on displays bigger than 1,024 x 768, the grainy look of most Web cams will be pretty hard on the eyes. One area that doesn't seem configurable is the video compression settings, but those seem largely self-tuning. Experts may be irked that they can't manually force the compression quality, though.

MSN has some nice features other programs here don't. Shared Search lets users

That said, many of the extensions written for certain programs, especially AIM, are prone to suddenly stop working if said service changes how its protocols work. This goes double for video messaging. Trillian is most useful for people who want to establish video connections with users on different systems. If you primarily only deal with one service, the program isn't as useful. Trillian's free version includes video chat, but I tested the for-pay Pro version (a 15-day trial is available).

Video support for Trillian works in the majority of chat clients, including AIM, MSN Messenger 6.2 and higher (only the video conferencing feature, not the Web cam feature), Y!M 6 and up, and Apple's

iChat AV. ICQ's video chat doesn't work yet. Trillian is smart enough to understand how to implement video chat separately for each program. For example, it understands how Y!M has both Basic and Super modes.

The bad news is that video connections between Trillian and non-Trillian clients didn't seem very reliable. Even with a direct connection on a LAN, I couldn't get a video conference working consistently with an AIM client, and MSN Messenger 7 doesn't support video conferencing with Trillian. I did get connections working reliably with Y!M's video chat. I also found it helped to already be in a conversation with someone when establishing an AIM video connection, but this lack of consistent usability hurts Trillian's potential.

One unique feature worth mentioning is Time Travel, a kind of instant-replay

it's not quite the one-size-fits-all solution it's intended to be, yet.

Yahoo! Messenger 6.0

Yahoo! got into the IM game awhile back, but it only recently added video conferencing as a standard feature. Y!M 6.0's video chat system works a little differently from the other apps here and, thus, it's a little more useful when dealing with video chat involving more than one person.

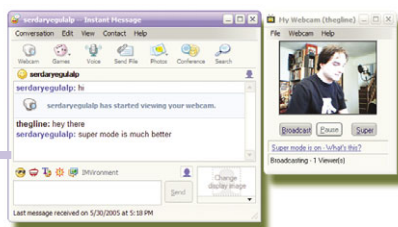
With Y!M you can set up your Webcam to view in a one-way fashion by anyone who wants to connect to it and see it. (The broadcaster can authorize who tries to connect to view the camera, if she chooses.) One user at a time can also connect directly in what Y!M calls Super Webcam mode, where the video connection quality is ramped up for a faster and more realistic-looking image (up to 20fps with a 320 x 240 maximum image size). Y!M's camera applet also provides detailed statistics about the video feed (bitrate, connection mode, etc.), and the camera's controls in Y!M's preferences include letting you change the compression quality.

Because of how Y!M is set up, there really isn't a one-on-one video conferencing mode. You can look at someone else's video camera without actually having to chat. If you want to perform audio and video chats, you can invite multiple people into a conversation and enable voice chat there. This approach might throw people off at first, but it allows for such possibilities a one-to-many video broadcasting, which is something no other program here can really offer. If you like your

Video IM Etiquette

As with any kind of communication, video chatting has its own set of dos and don'ts. Here are a few things to keep in mind:

- Use video only if you really need to, such as if you have something to demonstrate or if you're doing a remote meet and greet.
- Give plenty of notice before a video chat to give people time to look presentable (and maybe clean up their workspace, too).
- Establish a speaking order for multi-user conferences. The lag time for video IM is often long enough to give the illusion people are cutting each other off.
- Respect other people's bandwidth. Use conservative image and sound quality settings. Even if others have broadband, that doesn't mean it's as robust as yours.
- Use all other standards of meeting etiquette that you'd expect in a face-to-face meeting. Don't throw other propriety to the winds just because you're not in the same room.



Yahoo! Messenger 6.0

Free
Yahoo!
messenger.yahoo.com



function for video chats. ("Unfortunately, forward time travel is not available at this time," Cerulean Studios says with tongue firmly in cheek.)

If you need interoperability more than full support for every client's video chat feature, Trillian is worth looking into, but

privacy, there's a feature similar to one in AIM called Stealth, where you can log in without appearing on other people's buddy lists.

One feature that is still in beta but that looks promising is the ability to place free calls via the Internet through Y!M's system. ▲

by Serdar Yegulalp

The Word On Video Chat Clients

Seeing who you are chatting with is cool, but it isn't the only thing you should look for in a client. Here are a few pros and cons in regard to the apps we tested.

Product	Best Features	Worst Features
AIM	Easy to use; broadly adopted	Video controls not as flexible as some other clients
ICQ	Very flexible controls; editable video compression settings	Interface may confuse people new to the app
MSN Messenger	Ease of use; full-screen video mode	Can't edit compression settings; ads play at start of video stream
Yahoo! Messenger	One to many users can broadcast	Ads at start of video stream
Trillian	Interoperates with nearly all major chat clients	Doesn't quite support all features for all clients; video support shaky

CPU Ranking: 0 = Absolutely Worthless 1.5 = Absolutely Average 2.5 = Absolutely Average 3.5 = Absolutely Perfect 4.5 = Absolutely Perfect

Windows XP Professional x64 Edition

The 64-Bit Question: Now What?

Before Microsoft released Windows XP Professional x64 Edition on April 25, there really wasn't a reason for most Windows users to get excited about AMD's Athlon 64 processors. With the first 64-bit desktop Windows version now available, the question remains: Is there *really* a reason to get excited?



The Windows XP Professional x64 default Desktop.

Let's review: 32-bit x86 processors are limited to eight 32-bit general-purpose registers, eight floating-point registers, and eight SSE/SSE2 registers. The 64-bit CPUs double the number of general-purpose registers to 16 and double the width to 64-bit. The processors also offer eight new 128-bit SSE/SSE2 registers for a total of 16. CPU-intensive tasks—2D/3D digital content creation, 3D gaming, audio production, video editing, CAD/CAM, and game development—get a real kick in the pants from 64-bit processing.

In the Windows world, the environment for many data-intensive applications also improves. WinXP Pro x64 can virtually address 4GB of information per 32-bit process and a whopping 8TB per 64-bit process. The OS also supports up to 128GB of physical memory—much more data the processor can access far more readily. There's little doubt 64-bit computing is where all OSes are headed, even on the desktop.

Win x64 In Operation

WinXP Pro x64's kernel isn't based on WinXP at all; it's based on the SP1 release of Windows Server 2003. This will also be true of Longhorn. Microsoft cites reliability and security as reasons for choosing the newer Windows kernel.

Although WinXP Pro x64 is based on Windows Server 2003, it looks exactly like WinXP Pro. The only main differences that I could find were the default Desktop background, the System Properties dialog box (only because the Windows versions were named differently), and a subtle change in Task Manager that shows running processes that are 32-bit. (As long as 32-bit apps don't contain some sort of device driver, they run fine under WinXP Pro x64. They potentially could run faster or at least more efficiently with more than 2GB of RAM.)

I tested WinXP Pro x64 with a new HP dx5150 desktop sporting an AMD Athlon 64 3500+. The machine came with just 512MB of RAM, but you'll want at least 4GB to fully utilize 64-bit functionality. Even with 4GB there are few 32-bit or 64-bit Windows apps ready to take advantage of it. Microsoft claims that it's tracking more than 400 64-bit applications under development, but as of press time, those actually available were few. Some included software from ALWIL Software (avast! antivirus), Atari, Cakewalk (SONAR 4), CommVault, Computer Associates (eTrust EZ Antivirus 7.1), ESI Group, McAfee, NewTek (LightWave 3D), PTC, SoftImage (XSI), Symantec, Tiny Software, Ubisoft and AMD (FarCry x64), and UGS. In addition, Adobe is offering an extended 32-bit version of Photoshop that can address 4GB of memory under WinXP Pro x64. The 64-bit presence of most of the security products in this group is more or less invisible to end users.

Tough It Out

You say you have full-fledged 64-bit hardware already, and you want to make 64-bit Windows a reality? Cool. We have some tips that might make the excursion a little easier.

The first challenge is getting Windows XP Pro x64 Edition. The primary distribution method is with new PCs, but you can also buy it from online retailers such as Newegg.com. Microsoft is requiring retailers to sell the OS with a piece of hardware. Newegg.com sells the OS for \$155.95 with a \$5 hard drive Y-splitter cable, which it gives you \$5 off on. (Yuck, yuck.) There's also a free 120-day trial at Microsoft available. The download is 550MB, or you can order a CD for the cost of shipping (\$6.29 for us).

Microsoft and major OEM PC makers are also offering an x64 exchange program to owners of the 32-bit Windows XP Pro. (The 64-bit WinXP Pro costs the same as the 32-bit version.) This "Technology Advancement Program" is detailed at www.microsoft.com/windowsxp/64bit/upgrade/default.msp. You won't actually send Microsoft your 32-bit WinXP Pro copy. Instead, Microsoft will eventually deactivate your 32-bit copy. Your PID or COA serial number is required. These aren't the same as your Windows Product Key. You'll find the PID in System Properties.

Device drivers for components and peripherals may be your biggest challenge. Microsoft says it's unlikely there will be 64-bit drivers available for hardware older than two or three years. AMD does maintain a useful Web page concerning 64-bit device drivers. If you bought your computer from a major OEM PC or peripheral maker, that should be your first stop. I found that WinXP Pro x64 automatically detected and installed the correct drivers from its own driver pack for a 10-year-old HP LaserJet 5MP printer and a four-year-old Samsung 180T LCD display. ▲

The promise of future apps isn't an empty one, however. At Microsoft's WinHEC hardware engineering conference in late April, SoftImage gave me an extended demo of its 64-bit XSI 3-D animation digital content-authoring environment that blew me away. The quality and quantity of animated images was clearly superior running on 64-bit Windows than 32-bit OSes.

According to Brian Marr, Microsoft Windows product manager and a self-professed gamer, we should see games authored in 64-bit Windows to run on 64-bit Windows by year's end that will be visibly better, have more photo realism and background characters, and have a wider set of computer-controlled simultaneous events. Marr references SoftImage's XSI and NewTek's LightWave 3D as the leading tools in delivering improvements.

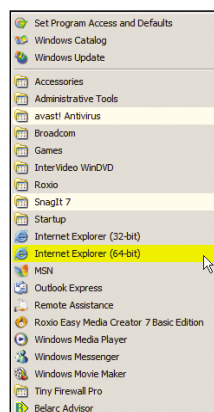
64-Bit Realities

For now, there isn't really much reason for power users to jump into 64-bit Windows. What's more, there are some

clear obstacles. The new 64-bit Windows OS does not support existing 32-bit device drivers for components and peripherals; the OS only supports 64-bit drivers. If you are thinking of upgrading an existing PC, you'll need to ensure that 64-bit drivers are available for your internal/external hardware.

WinXP Pro x64 also doesn't support 16-bit software, and that leaves out the installers of a lot more 32-bit Windows apps than you might realize. WinXP's console has always had pretty good support for DOS, but that's gone in x64, which supports 32-bit and 64-bit programs only.

When you open the Programs menu in x64, you'll find 32-bit and 64-bit versions of Internet Explorer. You'll need the 32-bit version to access such things as Windows Update and Web sites running ActiveX applets that aren't written in 64-bit (virtually all of them).



WinXP Pro x64's Programs menu offers 32-bit and 64-bit versions of IE.

Several other Microsoft apps—Windows Media Player, Outlook Express, and Movie Maker—are 32-bit in Windows XP Pro x64 and come with a \Program Files (x86) folder for 32-bit programs. In addition, WinXP Pro x64's setup disc can't perform an upgrade installation of a 32-bit

Windows installation. You must run a clean install. The easiest way to get x64 now is to buy a new 64-bit machine designed for WinXP Pro x64.

Shutdown

There's no doubt that 64-bit computing is the future; it's already here on other platforms. But WinXP Pro x64 is a bridge product aimed primarily at serving workstation users. However, it also gives developers the needed tools to build apps that take advantage of 64-bit Windows and processors.

Longhorn will simultaneously ship 64-bit and 32-bit versions, and Bill Gates has predicted 64-bit Windows will take off in 2007. AMD will have been shipping 64-bit desktop processors for more than three years by then and Intel for almost two years. By 2007 a small but critical mass of 64-bit apps will have shipped, and a robust set of 64-bit drivers should be available.

WinXP Pro x64 is Microsoft's proof of concept, designed to jumpstart hardware and software developers in time to fuel Longhorn's 64-bit edition. The long-term advantages are clear, but for now, 64-bit Windows on the desktop is little more than an intriguing novelty. Microsoft has executed it well enough, but its current value is limited to only a few. ▲

by Scot Finnie

The Differences At A Glance

The changes in Windows XP Professional x64 Edition bring great improvements, such as full support for 64-bit processors and breaking through the 2GB RAM barrier, but it also sweeps away things we've come to rely on, such as DOS support and a giant base of supported devices. The following details how 32-bit and 64-bit Windows compare. ▲

Source: Microsoft	32-Bit Windows XP Pro	64-Bit Windows XP Pro
Processors supported	1 or 2	1 or 2
Maximum physical RAM	4GB	128GB
Total virtual address space (based on a single process)	4GB	16TB
Virtual address space per 32-bit process	2GB (3GB if booted with "/3GB" switch)	4GB (if compiled with "/large addressaware"; 2GB otherwise)
Virtual address space per 64-bit process	N/A	8TB
Supports "No Execute (AMD)" or "Execute Disable (Intel) Bit"	No	Yes
OS kernel	Windows XP	Windows Server 2003 SP1
Kernel-mode device driver support	16-bit and 32-bit	64-bit
Application support	DOS, 16-bit, 32-bit	32-bit, Extended 32-bit, 64-bit
DLL support	32-bit only	64-bit only; 32-bit ActiveX applets will not run under WinXP Pro x64*

*Some Windows XP Pro x64 Internet-oriented clients (IE, Outlook Express, and Windows Media Player) are 32-bit apps so that they can support 32-bit ActiveX applets (among other things). These will need to be rewritten to support future 64-bit Windows versions.

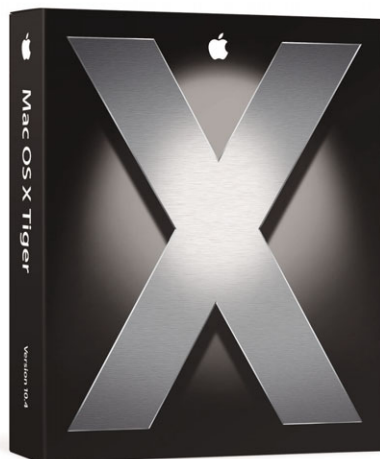
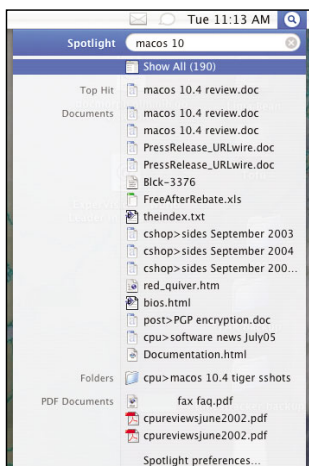
- **Windows XP Professional x64 Edition**
- \$155.95 (OEM street)
- Microsoft
- www.microsoft.com



CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect



- **Mac OS 10.4 (Tiger)**
- \$129 (single user);
- \$199 (five-user family pack)
- Apple Computer
- www.apple.com



Mac OS 10.4

The Roar Of The Tiger

Mac OS 10.4, also known as Tiger, is the latest upgrade to the Macintosh operating system. Despite a handful of problems that I experienced during a month of heavy use, the OS's new features and speedups make me glad that I put Tiger in my tank.

My Tiger experience started badly when the installer didn't recognize my G4's third-party PCI IDE card, leading me to believe that the hard drive was trashed. Switching to the Mac's internal IDE bus solved the problem. After that false start, Tiger proved to be a rock-solid (it never crashed in a month of use) and feature-filled upgrade.

Tiger has its share of eye-catching new additions, including Dashboard, an accessory that lets you plug in your choice of numerous widgets to access a wide variety of information. A single click reveals all your installed widgets, which might include a TV Tracker (displaying what's on the tube right now), a wireless hotspot detector, a weather monitor, and sticky notes. Dashboard is elegant but really isn't anything new. The shareware program Konfabulator has done a similar trick for years. In fact, I like Konfabulator a little better because its widgets can remain on the desktop all the time. Dashboard's widgets appear on top of all other windows, and only when summoned.

If you have lots of friends and processor power, Tiger's upgraded iChat AV conferencing tool can let you video chat with up to three other people in a virtual conference room or audio chat with up to 10 people. iChat is elegant, but multiperson video conferencing only works with other Mac users. Meanwhile, problems that I had encountered in Mac OS 10.3 (Panther) while trying to videoconference with Windows users remain unresolved.

Once you move past Tiger's glitzy additions, you can appreciate the features that prove useful in your day-to-day routine. The new search tool, Spotlight, is worth the price of admission itself. Spotlight is speedy at finding data anywhere on your hard drive, even when you can't remember the file name or folder it's in. When you type a phrase into Spotlight's omnipresent search field, it shows the files that contain that phrase, including word processor documents, PDF files, email

messages, and calendar items. Because it pre-indexes files, searches are nearly instantaneous, which is much more satisfying than the old search tool, Sherlock. When you're trying to find a bit of information in a 1,000-document haystack spanning several years, Spotlight is like magic.

Tiger's Internet tools are nicely honed, as well. The Safari Web browser has added an RSS reader and privacy tool, and Safari is faster than Firefox. A new screen saver, RSS Visualizer, shows your chosen RSS feed in a stunning display. Apple's Mail client brings an improved UI, and I found the client much more forgiving of balky IMAP-over-Wi-Fi links. Where you often needed to coddle the Mail's previous version to reconnect to the mail server, this version just works.

Another new Tiger tool is Automator, which can automate complex or repetitive tasks. These Workflows can perform tasks such as copying unread email to your iPod or combining several PDF files into a single document and then watermarking the pages. Automator could prove a useful tool for users who don't want to learn their way around AppleScript. Although I typically spend all day at my Mac, I wasn't able to find any chores that Automator could really help with, perhaps because Automator isn't a mature technology, or perhaps because I wasn't able to "think differently" enough to find a use for it.

Tiger will save time even for users who never bother to learn their way around Automator, as the OS is generally speedier than Panther. Other time-savers include a dictionary/thesaurus application that doesn't require Internet access to do lookups and full-screen image slideshows in Preview, Mail, and other applications.

Tiger requires a Mac with a G3 or later processor and an internal FireWire port. You need at least 3GB of free drive space, 256MB of RAM (although 512MB is the realistic minimum), and a DVD drive for installation. (If your Mac does not have a DVD drive, you can special-order the installation discs on CD.) Mac OS X has developed into a mature, elegant OS. With a dose of glitz and functional tune-ups, this is an upgrade that all Mac users will be able to appreciate. ▲

by Kevin Savetz

LizardTech Genuine Fractals 4.0



GenuineFractals 4.0

\$159

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Even with a 6MP camera, increasing the image size with interpolation so that you can create oversized versions suitable for wall display can be challenging. Photoshop CS uses its own bicubic interpolation to upsize images. Genuine Fractals, a PS plug-in, claims to do a better job.

To test, I used a Polaroid SprintScan 4000 to create a 39MB 4,891 x 2,784 image from a slide, yielding 16.3 x 9.28 inches at 300dpi. I cropped an area to measure 8 inches high and then "ressed-up" to 24 inches using bicubic interpolation and then Genuine Fractals. Whereas PS' conversion is nearly instantaneous, GF took more than a minute to process.

Under magnification differences between the two approaches become apparent. PS' bicubic interpolation performs very even blending between dark and light edges for a softer look. GF has more tone banding and boosts contrast

sometimes to accentuate edges. On a blank sky, this deepened the film grain noise. At high zoom GF looks artificial; at full size it looks natural.

Next, I used a 3MP image and took a 640 x 1,044 cut at 72dpi. LizardTech says GF will preserve image quality up to 700%, so I took things up to 4,480 x 7,308 at 300dpi for a 14.9- x 24.4-inch size. Here the differences were more noticeable at 100%. Bicubic interpolation looked soft and prone to bright spot blooms. With GF, fine details popped out better, and many details stayed truer. Skin textures, however, seemed more waxy, and straight edges appeared where there should have been natural curves.

For portraits, I prefer PS' bicubic interpolation. For shots with natively hard edges, GF is better at preserving edges under substantial "ressing-up." GF is also better with small source images. I took a 78KB GIF up to a 1MB TIF for printing. With PS' interpolation it was unusably pixelated. GF's version was acceptable. ▲

by William Van Winkle

InterVideo MediaOne



Media One

\$79.95

InterVideo

www.intervideo.com



Like Nero and Easy Media Creator, MediaOne offers a suite of apps for burning data to CD/DVD. While the apps don't work as a truly integrated suite, you can access all the features via a LaunchPad interface. Just choose Video, Music, Data, Backup, or Photo and MO lists respective tasks. Individual apps are listed in a side menu.

LaunchPad strangely omits one-click access to rip audio tracks. You must run Disc Master, highlight the tracks, and choose Tools and then Extract Audio CD. Tools for modifying volume, removing pops and hisses from vinyl recordings, and mixing audio tracks are also absent.

More useful is the backup program for partitions, drives, folders, or files. Even novices will find it easy to define what to back up and to schedule automatic unattended backups. The app reliably backed up a mix of folders and files from a 120GB drive to a CD-RW in my testing.

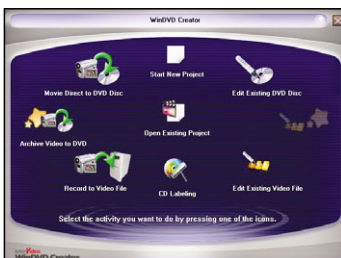
PhotoAlbum lets you organize, view, email, and print digital photos and has a handy batch file tool to rename photos. The feature renamed

122 of my images with one mouse click. After adding tags to images, such as a rating or subject, PhotoAlbum organizes images into categories.

MO burned CD/DVDs at speeds comparable to Nero and Easy Media Creator. The app had no problem copying 3.3GB worth of home videos and burning them to DVD and VCDs. It let me capture video from my Sony DVD camcorder via a FireWire port and record it directly to a disc or hard drive, where I could add transitions, titles, and filters. An included disc label creator can help design and print labels. (You must buy the labels and application device separately.) I tested on a Compaq computer with an AMD Athlon XP 3000+, 768MB of RAM, Windows XP SP2, and a CD-/DVD-RW drive.

MO feels like a set of loosely integrated individual apps, but each offers the basics. If you work with digital audio, MO isn't really for you. For video, digital images, or data backup, it provides a good mix of power and simplicity. ▲

by Wallace Wang



CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Windows Software:

Ugly, Boring & Uninspired

Thanks to my new PSP, I don't think I'll ever finish this column. If you own Sony's new gaming device, you understand why; it's that addictive. A few days ago, I sold three of my game consoles just so I could purchase a PlayStation Portable. I don't believe in gadget overkill, so I try to keep my shelves lean. As a general rule, I dislike Sony's empire; it is all about creating unnecessarily proprietary formats for no reason other than to force users to stay within its brand. I don't swallow that tripe, and you shouldn't either. However, Sony broke the mold with the PSP, making everything else seem antiquated in the blink of a cursor.

I was willing to trade in my GameCube, PS2, Nintendo DS, and a handful of games for a single handheld experience. Why bother sticking with systems that seemed to be only collecting dust? Seldom do I find myself sitting in front of the television for any reason, so I've never been too hip on being tethered to a TV. The DS was a wonderful diversion, but I found myself unimpressed, bored rather, with its dated graphics engine. The PSP (and its growing set of titles) has been a breath of fresh air, drawing me into pixel seclusion at any given moment.

Too bad I can't say the same about the Windows platform, eh?

Software for Windows is generally uninspired, generically cloned, and overwhelmingly wrought with lackluster (read: lousy) user interfaces. There's too much coal and not enough diamonds within the sphere of downloads. The greatest pieces of software are plagued by unintelligent design, and very few rise to the level of ubiquity. Windows users don't have a strong sense of belonging; there's no user community rallying around the platform. We use the computer, certainly, or is the computer using us?

A few months ago, Apple made a move to win over the minds, hearts, and fingers of the world's most curious users. Since iPod mania has stretched well beyond the confines of OS X, getting geeks to spend another \$500 or so on a completely different experience was wise. It's not likely to attract a noticeable amount of folks, but enough to make a difference in mind-share. I already see it happening. The "coolest"

software today seems only to have been developed for OS X. Prove me wrong, CPU readers.

One application that typifies the creative elegance that you can find on systems outside of Windows is Comic Life from Plasq (plasq.com). Be forewarned: It's likely to drive even the most die-hard Windows user to switch to OS X. It runs well, looks amazing, and does something so incredibly unique you'll find yourself wanting to take more digital pictures just to make another comic strip out of 'em. Yes, Comic Life turns your images into comics, and anybody can use it, as there's virtually no learning curve. Plasq is planning on developing a Win32 binary but is hard-pressed for an able developer at the moment (no surprise). That hasn't led me to keep it a secret, though; you need to know what you're missing because you're missing a lot.

With Apple's release of Tiger, widgets—desktop applets that each serve one purpose—have jumped to the forefront of everybody's imagination. Why? Because they look slicker than snot! Windows users might argue that Stardock (stardock.com) has had DesktopX for years. That's true, but 99% of its existing widgets look absolutely horrendous. At that point, what's the point? Again, we come back to the concept that Windows software developers rarely develop any kind of pleasant UI. There may be hope with Kapsules (kapsules.shellscape.org), although it suffers from a lack of useable widgets. Konfabulator (www.konfabulator.com) has an OS X and Windows version of its rendering engine with an extensive collection of sweet-smelling widgets, but each one sucks up an insane amount of system resources (making the utility completely unusable for an extended period of time). At least it's cross-platform.

Getting back to the PSP, I can only find one computer-based utility worth registering and using regularly. It's PSPWare (www.nullriver.com/index/products/pspware). It's not from Sony, and it only runs on OS X. It also plans on porting its fantastic front-end to Windows eventually. Wait a second. Wasn't the shoe on the other foot just a few years ago? All the cool developers have moved to OS X, it seems. Hell must've frozen over? ▲



Chris Pirillo (lockergnome.com)
is stuck on dial-up this week,
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You can dialogue with Chris at chris@cpumag.com.

Console Computing

As machines, computers should behave deterministically, meaning that the same sequence of actions always leads to the same results. Most machines we use work this way. Flip a switch, the light goes on; if it doesn't, change the bulb, and it should work.

When hardware fails PCs usually do work this way. When a boot drive fails, an error message usually indicates "No operating system found." A nonfunctional keyboard usually needs a cable reconnected. PCs with dozens of active programs may seem to behave nondeterministically. Between the operating system, applications, utilities, virus checkers, games, Web content, who knows what affects what?

Gaming consoles are complex computers that haven't spawned a huge user support industry, partly because you do only one thing at a time with them. You plug in a game cartridge and play the game. If you want to play the same game on your friend's console, you can do that, too.

PCs got popular because before PCs, you logged onto the mainframe and used the same software everyone else used. If the mainframe didn't have the software you wanted, you could ask your company to buy or build it, or you did without. PCs made it that much easier to run different software and do more things.

Now, we each have our own little mainframes, except instead of just one we have three or four or five (one at the office, one at home for work, one at home for the family, a laptop), and for most of those systems, we do all the system administration. That means keeping each system up-to-date with security fixes and new software upgrades and backing up important data and making sure that they can all talk to each other when necessary.

Even if we manage with just one computer, we have to depend on that computer to hold all of our stuff: email and work files and photos of the kids and our favorite music and games and tax documentation and all the rest of it. Even if we have a backup, if the hard drive goes south, we've got a situation to deal with. If a forced software upgrade causes the system to crash, likewise. Ditto if a cracker gets in.

I want three things from a computer: safety, reliability, and simplicity. Safety means data is processed accurately, and attackers can't easily view, change, or delete it. Reliability means my data and application are always there and always accessible. Simplicity means easy to use.

That's why I'm taking a cue from the gaming world. Instead of personal computing, where everyone has his/her own PC, I'm turning PCs into console computers that I can use as safely, simply, and reliably as my own. By customizing Knoppix LiveCDs for different application modules—writing, programming, Web administration, home finance, etc.—I can run my more sensitive applications any time, and when I'm done I can store LiveCD and USB storage securely in a locked drawer or safe.

I'm building KNOPPIX Live CDs appropriate for each member of my family.

Everyone gets the basics—browser, email, simple word processor—and everyone gets fileserver storage. My wife gets encryption, scheduling, and spreadsheet software that she needs for her work; Jacy gets chess and Logo; Zoom gets flashcards and keyboard training. I get business and household accounts run separately and stored safely on USB drives, out of reach of both script kiddies and my own kiddies. And if our home PCs become inaccessible or we want to work offsite, we can be up and running in moments on some other PC.

Decentralized PCs beat mainframes, hands down. If you incapacitate a mainframe, everything goes down; incapacitate a PC, and only one user is affected. But that was 20 years ago. Now, instead of mainframes, we're each running centralized PCs with many apps, and that's much more vulnerable to accident as well as attack. With so much of our lives now stored on or revolving around our PCs, there's just as much potential for personal catastrophe due to system failure as there once was potential for corporate catastrophe due to mainframe failure.

Let me know what you want from a console computing module (email me at console@internet-standard.com), and I'll list the most interesting in an upcoming column. ▲



Pete Loshin, former technical editor of software reviews for Byte Magazine (print version), consults and writes about computing and the Internet. He also runs www.linuxcookbook.com. Pete owns shares of both Microsoft and Red Hat and believes that Windows isn't for everyone, but neither is Linux.

... I'm turning PCs into console computers that I can use as safely, simply, and reliably as my own.

You can get saucy with Pete at pete@cpumag.com.

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TV By Phone

Will IPTV Super-Size Prime Time?



TV may get cooler in the next few years, courtesy of the Internet and your phone company. If Verizon, SBC, and Microsoft have their way, your phone and DSL wire may be dialing up the next generation of TV options. Imagine customizing your TV screen by placing the baseball scoreboard anywhere on-screen. Or how about having the caller ID appear on your TV screen? In an effort to take on the cable and satellite TV providers, telcos are promising that IPTV (Internet Protocol Television) will supercharge TV viewing by sending live TV and VOD services through the same IP packet delivery mechanism that powers Web browsing.

Not Your Father's TV Or Internet

Not only is IPTV *not* your father's cable TV, it isn't even your father's Internet because it represents different approaches to both technologies. Cable TV broadcasts all of its available channels simultaneously into the homes of all its customers, and the in-house tuner switches to a specific incoming stream. But like Web browsing, IPTV pulls only the specific live TV channel you want from an ISP's server. "In its most basic form, the packets of information traversing the network are no different from the packets in the Internet. It passes through the same equipment," says Steve Vogelsang, VP, marketing, Laurel Networks. Unlike cable, even digital cable, where unused channels still occupy bandwidth, IPTV sends only one channel to an individual device and so gives it the potential for the same infinite choice as the Internet itself.

IPTV is a complex, multistep process. Satellite feeds of networks such as CNN come into regional and local offices just as they do for cable providers. In IPTV, however, data is compressed by video codecs, usually MPEG-4 or Windows Media 9. The TV channels are then encapsulated

into IP PDUs. Next that data goes through dedicated routers and servers that detect and serve the channels you call up from home. Heavily used on-demand videos would be cached at these local office servers and closer to the end users. Curiously much of the IPTV system doesn't utilize the general Internet backbone at all.

Rather than share the same data paths as your Web browsing, IPTV uses the same broadband pipe for a better-behaved managed network: dedicated servers at the ISP that deliver only TV data to set-top boxes across a reserved portion of your bandwidth. Normal Web traffic runs in bursts, which causes streaming video pauses and uneven site loading. IPTV's managed networks assure continuous bandwidth (up to

25Mbps) so that even HDTV signals of 5Mbps to 6Mbps play on that home plasma without impolite video burping or pixilation. Also, other broadband tasks on the same pipe remain separate.

IP Is Key

Because it uses the same pipe, protocols, and home network as your PC and Web connection, IPTV is supposed to integrate easily with PC data such as email, photos, and MP3s. Every screen element or multiple windows can pull in a discrete, personal stream of IP data.

The link between VoIP and IPTV not only allows on-screen caller ID, but it lets you phone in programming instructions. For instance, to use the caller ID feature,

GUIDE		8:07 PM
THU 11/22	8:00 PM	8:30 PM
1 REC	Deep Blue Sea	Recorded TV
2 VOD	Seabiscuit	Video Store
3 HBO	Sex and the City	Curb Your Ent
4 KGO	Mountain View Plot	Six Feet Under
5 KRON	Friends	Will & Grace
6 KPIX	Lord of the Rings: The Fellows	CSI: Crime Sc

Mountain View Plot
8:00 - 9:00 PM TV-PG 4 KGO
Drama (1995). "The Legal Huddle" - Karen reviews the defense attorney credentials and finds the last missing link for her ...

Not surprisingly, Microsoft TV's IPTV interface looks exactly like its Media Center PC OS. Some IPTV systems may stream preview clips of upcoming shows directly into a guide like this.



You can call up an athlete's profile and even switch among available camera angles on a live event.



Microsoft promotes IPTV as a way to integrate TVs with a home media server to show personal libraries of slides or video.

pause the TV feed and answer the phone or use your remote to redirect the caller to one of several VoIP voice message boxes.

Vogelsang believes that VOD may be where IPTV makes its best case against cable. When you order VOD on cable, the service still needs to allocate a channel on its already full system for your order. Coaxial cable does have the kind of massive bandwidth required to run scores of TV channels simultaneously, but as HDTV and more VOD orders clog the system, they too may need to move to an IPTV approach that allocates bandwidth more efficiently. Because IPTV only needs to handle the streams of programming a set-top box specifically asks for at a given moment from the servers, VOD libraries could have unlimited breadth. Rather than being subject to the limited bundles of channel offerings from a TV company, IPTV could let you subscribe only to specific channels directly from a provider.

Fatten Up The Pipes

Telcos such as Verizon and SBC are rushing toward an IPTV rollout by 2006 because they want to compete directly with cable TV companies for the coveted "triple play" with consumers, providing voice, high-speed data access, and video services all from one broadband pipe. Cable companies already dominate home TV and high-speed data, and with VoIP they are moving into telco territory. The phone companies are responding by upgrading their DSL high-speed lines in hopes of stealing TV from cable and satellite.

The big question is: How much bandwidth can these companies bring to the

home? "When you buy a 1.5MB connection, in reality the service provider is only allocating less than 10% of that amount to bandwidth," says Vogelsang. Yet SD TV requires 3.5Mbps of compressed data per channel. And because every TV connected to an IPTV network pulls down its own flow of video, a service provider must have about 3Mbps to 5Mbps of guaranteed bandwidth for every TV in the home.

And so Verizon is digging up neighborhoods to install fiber wiring directly into the home, which will offer gargantuan bandwidth. SBC is upgrading much of its internal network with fiber and, according to Ed Graczyk, director of marketing, Microsoft TV will be using the next generation of DSL, dubbed ADSL2, to deliver up to 25Mbps. Other providers are upgrading to VDSL for up to 54Mbps of bandwidth.

Despite these upgrades, critics argue that for all of the talk about how an IP platform manages bandwidth more efficiently than cable, IPTV may end up choking on its own fat pipes. "If you only have 20 or 25 megs, what if you start introducing HD channels?," says Patti Reali, analyst, Gartner Group. "It can only support so many TVs in the household." Her Gartner colleague, Gauri Pavate, says that all of IPTV's fanciful features remain theoretical. "It all

depends on how much bandwidth will be allocated to the home," Pavate says.

Graczyk counters that bandwidth is not a real concern for IPTV. "Even at 20 megs, it can support four TVs, HDTV, DSL [data] service, and VoIP." Moreover, the MPEG-4 and other common IPTV codecs are still young. As with previous codecs such as MPEG-2, compression will improve and push more TV data through less bandwidth as the industry matures.

Do We Want Our IPTV?

The reality is that IPTV is complex and unproven. Oddly enough, the first Americans to experience futuristic TV delivery are in remote areas. For instance, an IPTV system from Minerva Networks now services the Twin Valley Telephone Company in rural Kansas. When Twin Valley launched its test with 80 volunteer households in 2003, "all of our equipment had never done video before," recalls President Mike Foster. "We had

Unlike IPTV, Akimbo uses the open Internet to deliver on-demand video to any household with a broadband connection and a TV.





Q&A Steve Shannon: Akimbo, The Other IPTV

Why wait for an IPTV rollout when you can get on-demand video from any North American broadband connection to your set-top Akimbo (www.akimbo.com) box? At \$9.99 a month, Akimbo offers tens of thousands of branded media programs that it downloads to its \$229 set-top box with 80GB of storage for later TV playback. According to company founder Steve Shannon, transferring TV over the open Internet rather than IPTV's managed network has some advantages that the telcos may eventually incorporate into their own systems.

CPU: How is Akimbo not IPTV?

Shannon: It's IPTV with a capital I. It operates over the open Internet, not a closed network. Our service is 100% on-demand. There is no broadcast or streaming or prescheduled component. It's available all across North America as opposed to being available just within a given network. It will be offered over a number of different devices, eventually, like television sets, DVRs, even game consoles.

CPU: What is the advantage of using the Internet?

Shannon: The most important one is our unlimited breadth. We only have one head end server for all of North America, so when we add a title to the system it's much less expensive. IPTV streams video and has to locate the video closer to the household. They have

head end servers around the network and local storage with a certain amount of capacity. To increase the capacity they have to do it throughout the network where we have only one server. For us, if we make a piece of content available and 10 people watch it, we make money. That means we can be much more aggressive in the breadth of programming.

CPU: On the other hand, IPTV's managed network is fast.

Shannon: We use a download model that has a downside. You have to have local cache [300 to 400 hours] of shows you are interested in. You can choose specific programs or choose broad level preferences like downloading all the new music videos, and we'll automatically push those down to your hard drive so you have a constantly refreshed list of programs. If you haven't downloaded the show yet, then you have to wait. We do most of our delivery in the middle of the night. We use that trickle method, so we don't require any consistent quality of service.

CPU: Will this eventually be incorporated into IPTV?

Shannon: I think we will, yes. We are working closely with a lot of telcos. Akimbo is the kind of feature that can be added into an IPTV system fairly simply. We go in and say let's add another 50,000 hours of download model VOD. ▲

issues." Glitches were finally ironed out by June 2003 for a formal launch. These experiences suggest that IPTV will suffer technical growing pains as it ramps up selectively around the United States and may not pose serious competition to cable and satellite delivery any time soon. The main advantage for IPTV's customers is bundled pricing, being able to have voice and video on the same bill.

But are we really looking for Jetsons-age TV, since most of us are just getting up to speed with cable VOD and DVRs? "[Telcos] are saying they are going to replicate massive video initiatives with storage and on-demand content in three years, and we're basically skeptical," says Reali.

IPTV may prove to be the same old new media story: you built it, but will they come? Both Verizon and SBC are promising initial rollouts by the end of this year and early 2006. They'll need to vault

serious regulatory hurdles because local municipalities traditionally grant franchise rights to any wired TV services that go into the home. Some providers may try to argue that IPTV skirts these regulations because it's a data service like the Internet.

And no one knows exactly which of these advanced, razzle-dazzle features the telcos will include in IPTV systems. Analysts anticipate the first IPTV packages will include super-charged interactive program guides that pop up video clips for a highlighted program or pull in listings that are related to a program or actor. Let's hope for more. After hyping next-gen features such as programming a DVR by phone and getting real-time stats when Barry Bonds is at bat, it would be supremely disappointing if IPTV's main advantage over cable was a juiced up TV Guide. **CPU**

by Steve Smith

Infinite Loop

Share The Load



Finally biometrics is being put to good use. If you've been stuck doing the laundry, you should look into "Your Turn," a new washing machine from Spanish designer, Pep Torres. Hook "Your Turn" up to your home computer and register your fingerprints on the sensor and then plug the sensor into the washing machine. The software only allows the machine to start if a different finger is placed on it each time. Now if Torres could only teach the machine not to allow red socks in with white shirts. ▲

Source: news.bbc.co.uk/1/hi/technology/4504393.stm

podcast.txt

I'm still struggling to understand the real benefit of the podcast. It's as if someone sat down after reading blogs for a few weeks and realized that with the wealth of well-written and insightful blog material out there, the only way to improve it would be to turn it into talk radio. Or maybe someone was just too lazy to type their ridiculously uninteresting personal thoughts and decided it would be easier to simply dictate.

In the past two years, the media decided that blogs were fantastic. Today the major news networks even dedicate a significant amount of programming time to discussing the views of bloggers. Perhaps this is because journalists are very lazy, and by passing off opinions as news, they don't have to do any actual work. I run a Web site based upon this very concept, and it has been working great for years.

The problem is that most blogs are absolute garbage. Ill-informed opinions. Rants. Complaints. As someone who spends a fairly large amount of time reading them, it often makes me wonder why I'm spending my time reading the poorly crafted thoughts of nobody in particular. And then I find that random thought. The stars line up and you find something completely brilliant scattered amidst the garbage. And you know why it matters.

The upside is that today this content is being transmitted textually. So you can ignore the grammar errors and typos. You can skim the rambling off-topic stuff. And you can read at your own pace. Thus a mediocre blog might take you a matter of minutes to find the gold inside or decide to abort. I mean, it may be a waste of time, but at least it's only 10k of data.

But now we have podcasting. This brilliant idea turns every would-be blogger into a talk radio host. Now if there is anything that blogging has shown us, it's that most people have nothing to say. And even worse, they are pretty bad at actually saying it. Most podcasts I've stumbled upon are so littered with 'Ummms,' awkward pauses, and noisy breathing into a microphone, that I struggle to listen to the words that are

actually being said. If the skills necessary to be a journalist are often lost on those who decide to blog, it only seems logical that the corresponding skills required to speak clearly and succinctly into a microphone are rare. But that doesn't stop people from trying.

The upside, of course, is that you can download these things and drop them on your MP3 player for listening in the car or at the gym. But would you really want to? There is so much professionally produced audio content to listen to; it seems awfully inefficient to use a real-time mechanism to sift through content of questionable substance.

And then there is the scary next-generation video casting. This is all the glories of podcasting mixed with the video-production quality of public access cable channels. And it all comes in a convenient 50 meg download, so now you not only can't control the pace, but you need a visual display device. No more listening in cars. Your home theater is crying already.

That said, podcasting has been used for some amazing purposes: the very amazing "Battlestar Galactica," re-envisioning that has recently aired on the Sci-Fi channel was paired with podcast commentary for each episode by the show's creator. This is a fantastic way to draw readers in. Those commentaries on DVDs are very addictive to many fans, but waiting a year for a DVD is a lot to ask. This tactic draws the fans to the official Web site in a useful and entertaining way. I hope more programming follows suit.

The real wins here are for people who will code tools to sift through the data to find those needles in the haystack of humanity's collective consciousness. Code tools are audio to text conversion, automatic summarization, and, most importantly of all, software to determine which information is trustworthy.

I guess on that level, the trouble with podcasting is really just like the problem with the whole Internet. When there's so much stuff out there, the trick isn't finding information, but rather finding the stuff that's worth your time. ▲



Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the 'Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

Now we
have pod-
casting. This
brilliant idea
turns every
would-be
blogger
into a talk
radio host.

You can use old-fashioned email to talk to me at malda@cpumag.com.

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CPU
COMPUTER POWER USER

Connotea:

Social Bookmarking For Scientists

As the Web has brought an explosion of information sources and a variety of new ways to organize and access that information, it has become apparent that the old methods for cataloging reference material, based on physical organizations such as libraries, are not only inadequate for the task, they are fundamentally inappropriate.

For example, the Web version of this magazine, which actually appears online each month before subscribers receive their printed copy and well before the mag appears on newsstands, happens to include some nifty features that do not translate well to print or the strictly physical realm. For registered *CPU* subscribers, the online My Special Features section includes My Personal Library, a bookmarking tool for linking to articles in *CPU*, *Smart Computing*, *PC Today*, *CE Lifestyles*, and the *Reference Series* publications. The tool supports editing and classifying of the links, as well as notations for each entry. Private to each subscriber and accessible from any Web-connected browser, the library is an easy way to collect and use references to articles on specific topics and technologies and is especially handy for researching prospective purchases, upgrades, and DIY modifications.

Now, if you imagine this tool expanded to include links to any content published on the Web and that each user may choose to share their references and notations in an open, tagged database, you have something closer to the social bookmarking tools available in various forms around the 'Net. While these tools often have similar properties, what sets them apart is the orientation of the group of users doing the bookmarking.

A general purpose social bookmarks manager site such as del.icio.us is not targeted at any specific type of user and lends itself to site linking, while the del.icio.us-inspired Connotea (www.connotea.org) was created by the publishers of weekly science magazine *Nature* (www.nature.com) as a free online reference management service for scientists to create and store article and Web site links, share them with colleagues, and expand their knowledge base through access to the references of researchers in similar fields. Although any online content can be reference

linked using the tool, Connotea has been designed to import bibliographic information from tagged articles printed in the *Nature* publications, as well as several other sites. The code is available (sourceforge.net/projects/connotea) for use and modification under the GNU General Public License, and other publications are encouraged to participate by adding what the *Nature* journal Web sites now offer: a Save This Link feature on article pages, easily enabling their addition to Connotea libraries.

As a new print subscriber to *Nature*, I was quite overwhelmed by the weekly barrage of articles and soon accumulated a backlog of issues needing my concentrated attention. Access to Connotea has reoriented my science reading to lists of articles that fall into various topic clusters of specific interest to me. What I used to attempt with Google searches, I can now accomplish using scientist-filtered, notated, tagged links to articles that provide a range of viewpoints on different aspects of a subject. I've also noticed that article authors often link to related articles in addition to their own work, which can provide an amazing wealth of research information for drilling down into a topic. This could also function as a wonderful method for scientists and journalists to store their archived research material. Still in beta, Connotea has full functionality. Users are encouraged to submit suggestions and feedback for features and improvements.

The most intriguing part of social bookmarking is that there are generally no rules about user-chosen categories (tags) and notations. Meaning that I could tag an article on new CPU technology with whatever word or words make sense to me and others are free to do the same. While this may sound like absolute anarchy, as the volume of users goes up, the tags become more valuable as linked concepts representing a topic to a wide range of users. Concepts in common reinforce each other, and links sharing the same user or tag can lead similarly oriented users to more links. Coming back closer to home, if these features were added to the *CPU* My Personal Library tool, you can extrapolate the additional usefulness that could result. ▲



As founder and president of indy game developer Mango Grits, she talked 3Dfx out of prerelease Voodoo hardware to develop flying game Barrage for Activision then co-founded and ran hardware review site SharkyExtreme.com as managing editor. She currently plays with small, wearable PCs and big, rack-mount visual simulation image generators for Quantum3D while secretly plotting to save the world through a series of international location-aware multiplayer handheld games.

The most
intriguing part
of social
bookmarking
is that there
are no rules.

Tag joan@cpumag.com

ROAD Warrior

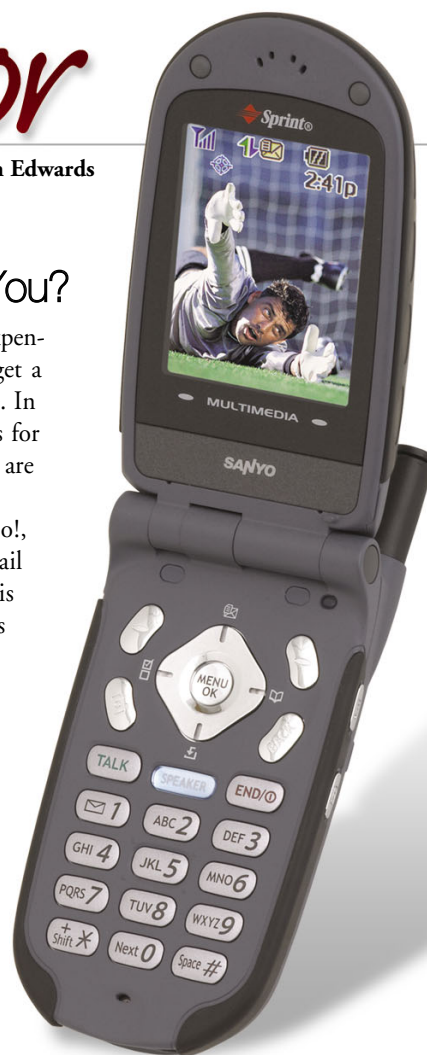
by Jen Edwards

Cell Phones Getting Cheaper, But Will It Cost You?

Without a doubt mobile phones and cellular service rates are getting less expensive. Walk into almost any related store and you'll likely find you can get a rather capable phone with a color screen free or at an extremely discounted price. In addition, most service plans are offering substantially more talk time or minutes for less than in the past. The bad news is that many extended services that carriers are providing increase your wireless phone bill instead of shrink it.

One notable example is a recent partnership between Sprint and Yahoo!, resulting in a Yahoo! Mail for Mobile client that offers enhanced Yahoo! email services to Sprint customers. Although Yahoo!'s basic email service is free, this enhanced service adds \$2.99 a month to a Sprint bill. The service includes faster email access (including the ability to store messages on a phone) and an improved UI. Yahoo! instant messaging is also available to subscribers at standard Sprint text messaging rates. The service is currently only available to users with high-end phones, such as the palmOne Treo 600 and 650, the Samsung A700, and the Sanyo 5600 and 7400.

Sprint also offers mobile TV programming for Vision subscribers, as well as access to a special version of Handmark Express for news, weather, sports scores, and local information, also for a monthly charge. Verizon Wireless is currently experimenting with a VCast service, which offers subscribers with a compatible phone access to sports and entertainment video clips, plus games; music; mobile Web access; and unlimited AOL, Hotmail, or Yahoo! email for \$15 a month (in addition to voice and data plan charges). ▲



With the Sanyo MM-7400 mobile phone, Sprint customers can access enhanced Yahoo! email service for a monthly fee.

Palm OS-Powered Handhelds To Say Goodbye?

An announcement at the annual PalmSource Mobile Summit & Developers Conference in May left some developers wondering about the future of the Palm OS platform. Contrary to some recent reports, Palm OS isn't dead, but it is possible that in five years we won't be talking about the OS, either. That's due to the news that palmOne, makers of Palm OS-based devices, will pay PalmSource \$30 million over the next

three-plus years for the exclusive right to use the Palm trademark, which the two companies had previously shared after Palm Inc. split in 2003.

PalmSource, which develops the Palm OS operating system, was given a four-year transition period in the agreement to use the Palm name. palmOne is expected to change its name back to just Palm this fall. What isn't yet clear is the future name and branding of the

Palm OS platform. PalmSource is working on creating a new name for its company, as well as the OS platform. In a separate announcement, palmOne did agree to license Palm OS through 2009, making minimum royalty payments to PalmSource in the amount of \$148.5 million. After 2009, however, it's possible that the Palm handhelds palmOne creates may not even use a Palm OS-based platform. ▲

LifeDrive Provides A Laptop Alternative In A Small Package

palmOne's LifeDrive handheld isn't a traditional handheld at all, at least storage-wise.

The LifeDrive, palmOne's first device in its Mobile Manager line, includes numerous features typical of a PDA, including 64MB of RAM, Bluetooth and WiFi networking, a headphone jack, an infrared port, and a SD/SDIO/MMC card slot. The device, however, also has a 4GB Hitachi Microdrive that's capable of storing two hours of video, 1,000 photos, 300 songs, and more.

The handheld is designed to function as a traditional organizer/PDA but also provide several advanced features. For example, Camera Companion makes transferring photos from an SD card to the LifeDrive as easy as one stylus tap, while Drive mode lets you share files with a desktop system in much the same way as using a USB flash drive. And because the LifeDrive supports USB 2.0, file transfers and more traditional

HotSync operations are faster. At \$500, however, the LifeDrive is still fairly pricey.

In related news, palmOne also recently launched the Treo 650 smartphone in Spain and, closer to home, in Mexico via a partnership with communications operator Telcel. The quad-band world phone will work with Telcel's EDGE high-speed data network and should be available throughout Mexico as you read this. ▲



The palmOne LifeDrive is the first handheld to be widely available in the United States to integrate a 4GB hard drive capable of ample multimedia storage.

Let The Music Do The Talking

In a move we should probably expect to see again and again in the near future, Napster and Ericsson have joined forces to create a mobile music service that the companies plan to jointly offer mobile operators to, in turn, offer their respective subscribers.

The service will involve taking advantage of existing

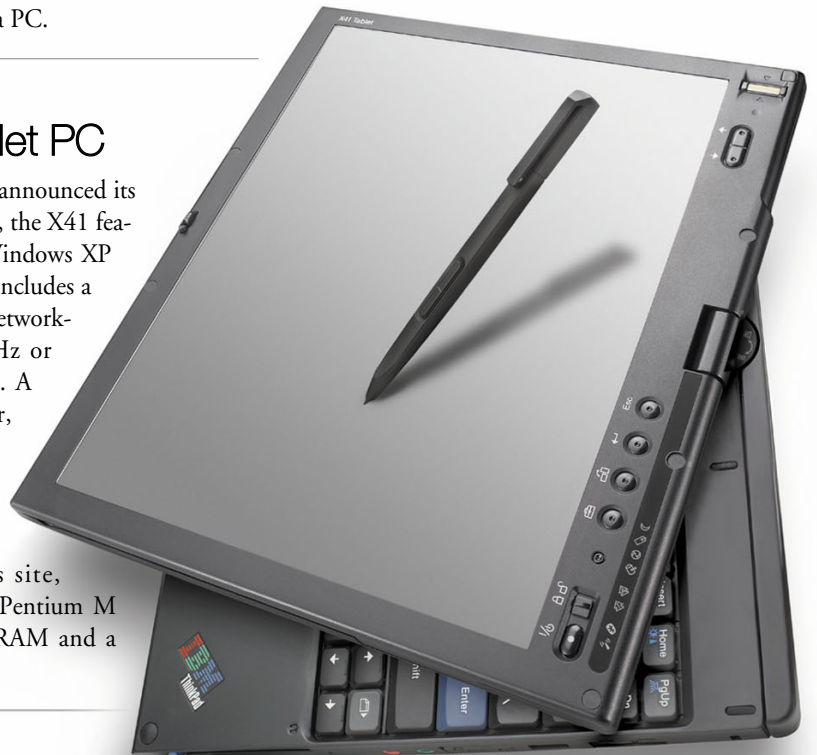
Ericsson technology to let mobile users download songs from Napster's music catalogue via a subscription (currently \$9.95 a month) or on an individual song or album basis (now 99 cents a song). Downloads are expected to be available both over a mobile network and through a PC.

Several phones already on the market, as well as upcoming releases, are said to be capable already of such downloads and of handling digital management right issues. You can expect to see the Napster-Ericsson service materialize

within the next year. Meanwhile, Apple already has a similar deal in place with Motorola—the first iTunes-compatible phone from Motorola is rumored for a summer release—and reportedly with Nokia. ▲

New ThinkPad Adds The Advantages Of A Tablet PC

Lenovo, which took over IBM's PC business, recently announced its X41 Tablet ThinkPad. Unlike traditional ThinkPads, the X41 features a convertible tablet design and runs Microsoft's Windows XP Tablet PC Edition 2005 with Service Pack 2. Hardware includes a 12-inch screen, full-size keyboard, and optional Wi-Fi networking. Two processor options are being offered (1.2GHz or 1.5GHz), and the unit supports up to 1.5GB of RAM. A standard 4-cell battery offers about 2.5 hours of power, while an optional 8-cell upgrade provides six hours. Select models will have an integrated fingerprint sensor, and although there isn't an integrated optical drive, an optional dock with a CD-RW drive is available. Lenovo/IBM is showing details of the X41 on its site, with standard pricing starting at \$1,899 for a 1.5GHz Pentium M Processor 758 low-voltage processor with 512MB of RAM and a 40GB hard drive (a 60GB upgrade is available). ▲

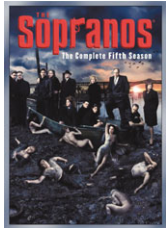


At Your Leisure

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest and most interesting releases in PC entertainment, consoles, DVDs, CDs, and just leisure and lifestyle stuff we (for most part) love and recommend, read on.

Audio Video Corner

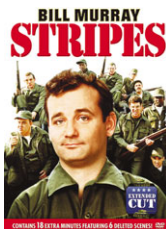
DVDs by Samit,
CDs by Blaine A. Flamig



\$99.98
Home Box Office
www.hbo.com/sopranos

The Sopranos: The Complete Fifth Season

Welcome to the fifth season of America's most interesting mob family. Season Four took steps toward focusing on Tony's family side, but Season Five (once more on four single-sided DVDs in a fold-out case) comes out swinging. This season's key entries are Tony Soprano's just-released ex-con cousin Tony Blundetto (Steve Buscemi), Carmela's desire to leave her husband, Adriana's betrayal, and the Lupertazzi family power struggle. The unforgettable characters make this show one of the best currently playing on television. And it's all in 16:9 widescreen with Dolby Digital 5.1 audio (but a bit light on extras). For those not familiar with the Soprano family, there are the first four seasons to catch up on via rental or retail.



\$19.94
Columbia Pictures
www.sonypictures.com/homevideo

Stripes: Extended Cut

A long time ago in a decade far, far away (before "Lost In Translation" and "The Life Aquatic with Steve Zissou") there was the Bill Murray comedy cult classic known to us common folk as "Stripes." The film was released to DVD in early 2003 and was abysmal in pretty much every department. Fortunately, the latest release of this 1981 laugh-fest features two versions of the film: original and extended. The extended version includes about 18 minutes of new footage incorporated into the original through seamless branching. The extended cut is funny, but it's also clear why the scenes were cut. This is the best "Stripes" looks and sounds, so don't miss it.



DVD Byte

June 29, 2005

A Film About Jimi Hendrix (Deluxe Edition)

Gunner Palace

The Ren and Stimpy Show: Seasons Three and a Half-ish



July 5

Bride & Prejudice

Fantastic Four: The Complete 1944-1945 Animated Television Series

Monk: Season 3

July 12

A Very Long Engagement

Million Dollar Baby

Tales From The Crypt: The Complete First Season

July 19

Constantine (2 Disc Deluxe Edition)

Earth 2: The Complete Series

Sliders (Dual Dimension Edition): The First & Second Season

July 26

3rd Rock From The Sun: Season One

The Jerk: 26th Anniversary Edition

Remington Steele: Season One

Star Trek Enterprise: The Complete Third Season



\$14
Capitol Records
www.coldplay.com

Coldplay — "X&Y"

Coldplay comparisons to U2 are all the rage, and they're warranted, especially in terms of sales. "X&Y," this year's most anticipated album since U2's "How To Dismantle An Atomic Bomb," is selling through the roof and topping charts everywhere. But where Coldplay can match U2 at every step with its crescendoing, surging tracks, it can't straight-up rock like the Irish lads. Some call this Coldplay's weakness, others its strength. What's certain is that "X&Y" eventually gets under your skin and resonates.



\$14
Virgin Records
www.gorillaz.com

Gorillaz — "Demon Days"

Gorillaz may just be a fictional band made up of cartoon characters, but it's still a damn good band. Dan "the Automator" Nakamura is out this time around, but DJ Danger Mouse is in, and that's good. No matter. Gorillaz is really the virtual, animated outpourings of Blur's Damon Albarn and illustrator Jamie Hewlett. With a varied, inspired list of guests onboard (De La Soul, Dennis Hopper) and trippy bass lines aplenty, "Demon Days" is darker, more foreboding, and more Blur-like than the hip-hop heavier Gorillaz's self-titled debut, but it's just as fun.

See the full reviews from A/V Corner at www.cpumag.com/cpuaug05/AYL

GUILD WARS

Player vs. Player MMORPG Utopia

Buy the retail boxed Guild Wars (and perhaps future additional add-on content), but pay no monthly fees. That's an impressive feat considering how enjoyable the game is and how long you'll be playing it.

The quest/RPG portion of the game is entertaining, and the design does away with a lot of the delivery-type quests and extensive travel times. The story arc is well presented and you'll get cut scenes that move the storyline for your party along. The aggression level of the creatures is dialed a wee bit too high, so you'll find yourself in the tedium of fighting when it's not necessarily something you'll want to spend your time doing. Creating the ideal party is also more difficult compared to World Of Warcraft but you can pick from AI members that will help you on quests

(picking a balanced party is far more effective). Having only eight slots for spells is frustrating but does lend an air of strategy to the gameplay. We haven't even touched on the other major portion of Guild Wars, which is the PvP mode. The benefit of playing the non-PvP mode is to learn skills/spells that you can apply to combat with other players in the PvP arenas, in which you're introduced to whole new types of head-to-head gameplay without the fear of being battered and smashed up as a newbie in the RPG mode. Developer ArenaNet is definitely onto something.

Graphically, the environments and game worlds are stunning. The game even looks good if you play it in a desktop window, which may be a good excuse to jump to a dual-core processor. At the end of the day, Guild Wars is an incredibly polished and tightly knit product that, along with World Of Warcraft, is on our must-play MMORPG short list. That's high praise for a game with no monthly fees. ▲

\$49.99 (PC)

ESRB: (T)een

NCsoft

www.guildwars.com

Still Life

Forensic Adventuring

We keep hearing that classic point-and-click adventure gaming is dead, so it's nice to see an above-average adventure game making the rounds. (No, the recent Leisure Suit Larry: Magna Cum Laude travesty of an adventure doesn't count.)

Microids' latest foray into adventure games is Still Life, a sequel to 2003's Post Mortem. Experience with Post Mortem isn't required since Still Life is a stand-alone story. You play in the shoes of a certain Victoria McPherson. She's a young, up-and-coming FBI agent who's under a lot of pressure from the bureau to investigate and solve a serial murder case involving the murder of five young women.

While taking time off with her family, Victoria happens upon her grandfather Gustav's memoirs detailing a case he worked on in 1929 that is oddly similar to the current events. The game then plays back and forth between Gustav's investigation in 1929 and Victoria's situation in Chicago. Uncovered clues and details flesh out the gruesome details of the murderer as the game moves toward its climax.

The art and design in this game is pretty stunning, and you'll cringe as you visit crack houses and other equally unnerving locations. Unfortunately, the game features gut-wrenchingly hard puzzles that are sometimes completely out of context with the game, which really holds Still Life back from reaching the upper echelons of adventure gaming. The storyline and compelling characters make this a game we want to like more than we did, but it's worth a shot. Given a choice, we would go with the PC version, which is a better platform to showcase the game's graphics but also lends itself to improved puzzle-solving, thanks to the higher resolutions and detail. ▲

\$29.99 (PC), \$19.99 (Xbox)

ESRB: (M)ature

DreamCatcher Interactive

www.stilllife-game.com





DESTROY ALL HUMANS!

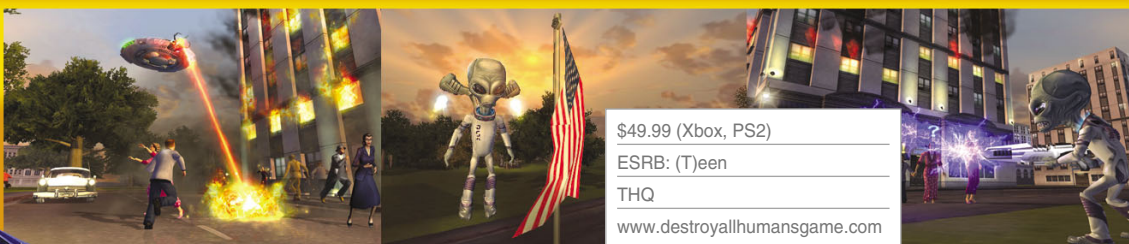
Antisocial Catharsis

Like most anyone who takes entertainment media seriously, we have favorite bands, favorite authors, favorite directors, and so on. Thanks to a string of quality games that in particular includes the LucasArts shooter *Mercenaries* and now THQ's *Destroy All Humans!*, we're officially adding Pandemic Studios to our list of favorite developers. The company simply has a knack for infusing its products with the most important element a game can have—fun.

Destroy All Humans! is a campy romp through '50s-era Americana as seen through the eyes of

Crypto, an alien sent to earth to prepare it for an all-out invasion. To that end, you'll help Crypto harvest human DNA, unlock the secrets of human society and a shadowy government agency called Majestic (think *Men in Black*), and generally cause as much destruction and chaos as possible. You'll stalk earthlings in third person and can mostly alternate at will between moving on foot and flying in your UFO.

The game is very solid technically, with crisp graphics, top-shelf sound, and simple yet precise controls. Mission objectives are pretty straightforward, and each area in the game offers a selection of sub-missions similar to *Grand Theft Auto*'s rampage missions. As the game progresses, Crypto can earn upgrades and additions to his considerable arsenal of mental abilities, handheld weaponry, and UFO technology; trying out your new powers on the unsuspecting cattle of earth (both figuratively and literally) is the most fun we've had with an action game in a long time. ▲



\$49.99 (Xbox, PS2)

ESRB: (T)een

THQ

www.destroyallhumansgame.com

Games For Kids



We try to review A-list games and leisure products targeted at adults just like us, but here are some titles for those of you interested in getting kids involved in gaming. I recently saw an adult buy *GTA: Vice City* for a 7-year-old boy just because he wanted it and that disturbed me. R-rated movies are not for the young 'uns and neither are M-rated games, so it's up to us to educate the ignorant on ESRB (www.esrb.com) ratings. (And no, we were neither paid nor coerced.) Happy gaming!

- Samit



MEDAL OF HONOR EUROPEAN ASSAULT™



Once More Into The Breach

By now there probably aren't many gamers unfamiliar with EA's *Medal Of Honor* series of World War II FPS games, which began way back in 1999 on the original PlayStation. The latest installment, *European Assault*, pits players against the Nazi war machine once more with somewhat mixed results.

The good news is that *Assault* has the same excellent sound effects, voice work, and music that have been a hallmark of the series from day one. The weapons sound eerily like their real-world counterparts, enemy soldiers and officers converse and shout in German, and the ambient noise makes it easy to become immersed in the game. *Assault* also serves up solid controls and fast-paced action, and has some new elements, such as more freedom to roam

throughout level maps and the ability to command your own fire team.

The team aspect of the game works quite well. Your AI team members will go where you send them and can certainly make a difference, as they draw significant amounts of enemy fire when present. Each ally has his own damage meter, and it's up to you to monitor your men's health and heal them with med kits if they get in a tight spot. Our only complaint is that sometimes you have to chase your guys to heal them because they tend to scurry around a lot even when they're following you and you stop.

The liability side of *Assault*'s ledger also includes game length (it's really too short, especially for a game with no online multiplayer support) and graphics that are OK but looking a bit dated these days. Nonetheless, *European Assault* carries on in the MOH tradition; as console WWII shooters go, it's pretty tough to beat this one. ▲



\$39.99 (Xbox, PS2, NGC)

ESRB: (T)een

EA Games

www.eagames.com

RISE of the KASAI

Family Resemblance

Rise Of The Kasai is Sony's follow-up release to The Mark Of Kri, a unique third-person action game that hit the PS2 three years ago. In Kri you played as Rau, a mighty warrior fighting to prevent the forces of evil from reviving an ancient evil. The game had a fresh mix of combat types and a control scheme that had players look forward to taking on multiple enemies. It also boasted gorgeous animated characters, and backdrops that looked like they were clipped right out of a Disney movie, which was an interesting look for an M-rated game.

The sequel serves up many of the same design and gameplay elements, but this time you'll alternate among several playable characters depending on the situation. The big new addition to Rau's world is his lately grown-up sister, Tati, who was born with a tattoo-like portion of the evil mark of Kri. Tati doesn't have Rau's brute strength but she's faster and more agile and provides some welcome variety.

Kasai looks and sounds fantastic, as did its predecessor, and the story is decent. There are some AI issues and a few graphical miscues here and there, but they aren't enough to rain on Rau and Tati's parade. ▲



\$39.99 (PS2)
ESRB: (M)ature
Sony Computer Entertainment America
www.us.playstation.com



grand theft auto San Andreas

A Well-Earned Rating

Grand Theft Auto: San Andreas took the PS2 by storm last holiday season (see our review on page 92 of the January issue), and now the PC and Xbox versions have hit the streets running. A quick plot recap: You play as erstwhile gangster Carl "CJ" Johnson, who reverts to his criminal ways when framed for murder by corrupt cops.

To be clear, San Andreas richly deserves its M rating; you don't want to play this game anywhere near a child or teen. That said, the game's world is a virtual sandbox that offers unparalleled freedom in where you go, what you do, and how you choose to accomplish the missions that carry the story forward.

If you're trying to choose a platform, we recommend the PC version. It's available only on DVD-ROM in a DVD-sized case and boasts an excellent manual that harkens back to the quality manuals of the '80s and '90s. The PC graphics are by far the best of the bunch, but there are some odd glitches; for example, early on a bicycle collision with a light pole inexplicably took the pole down. The Xbox version generally looks quite a bit better than the PS2's (although we did notice some unusual pop-up issues) and supports custom soundtracks using favorite tracks from your Xbox hard drive that's interspersed with GTA's excellent radio ads. Smooth. Control is not as good as in the PS2 version, but overall both the PC and Xbox versions are superior to the original, so we'd happily lead you to your preferred poison. ▲



\$49.99 (PC, Xbox, PS2)
ESRB: (M)ature
Rockstar Games
www.rockstargames.com/sanandreas

Shining Tears

Change Is . . . OK

OK, console fans: What's the first game that comes to mind when you see the words "strategy RPG"? It might be Final Fantasy Tactics, but if you're really old school, it will more likely be Shining Force; Sega has been

making excellent turn-based fantasy games under that name since 1992.

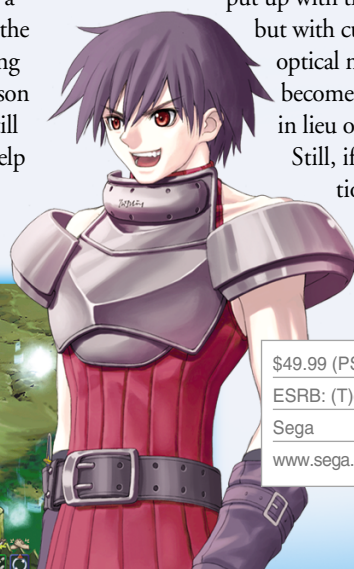
The latest go-round, Shining Tears, doesn't offer the strategic element that previous Shining titles did; it's an action RPG with real-time combat where you control two characters instead of a whole group. Of course, this isn't the first turn the series has taken genre-wise. The very first Shining game, Shining In The Darkness, was a first-person RPG on the Genesis back in 1991. But we're still partial to the strategy configuration and can't help being a tad disappointed.

That said, ST is a pretty decent game in its own right. It combines the Shining world and

character types with more action-oriented, real-time combat for an RPG experience that's not revolutionary but still entertains. In fact, our only real complaint is the boatload of text you have to wade through to advance the story. We were willing to

put up with this a few years ago, but with current consoles and optical media, RPG fans have become accustomed to voice in lieu of screens of dialogue.

Still, if you're into traditional console-style RPGs, Shining Tears will give you hours of fun. ▲



\$49.99 (PS2)
ESRB: (T)een
Sega
www.sega.com/gamesite/shiningtears



The Six-String Blues

Fretlight Takes The Pain Out Of Learning Guitar

I love technology, but I'll come clean straight away: I'm not a hard-core gamer, and I don't really aspire to be. But I've always been envious of those who are because they get to mix technology with their hobby. My pastime is playing guitar, which doesn't exactly translate into many practical convergence possibilities beyond recording. So as tech lovers, you can imagine my excitement at the opportunity to go hands-on with Optek's Fretlight Guitar (\$599.95), which blends technology directly into the guitar in a genuinely productive, resourceful way.

If you play or have attempted to, you know there's a lot of ground work to do before you ever screech out a song, including learning the names and locations of strings and notes, playing scales, forming chords, and just suffering through hours of practice. Tabs have made the learning process easier, but becoming a proficient player is still a tedious, frustrating journey many would-be players give up on before ever really starting.

The Fretlight threatens to change that, and the approach is surprisingly simple. Optek has embedded over 100 LEDs directly into the Fretlight's fretboard. So, after you connect the guitar to a PC via a dedicated USB cable, the bundled Guitar Power software lights up the LEDs. For example, say you want to learn all forms of a D minor chord. You just call it up in the software and the associated notes light

up on the fretboard, showing you exactly where to place your fingers. The same is true for thousands of chord variants, scales, arpeggios, and songs. Beyond Guitar Power optional software that works with the guitar includes M-Player, a MIDI-like player that lights the LEDs as a song plays, and AxMaster, a tool primarily for teachers. There's also an optional dual footswitch that lets you customize certain actions, such as changing tempos or looping a scale you're trying to learn.

I passed the Fretlight among several people in our office who play. We were all impressed with the Fender-styled guitar's solid make up. The fretboard is made of polymer and not wood, but it has surprisingly good action. There's also an attractive pearl-flavored pick guard and a humbucker pick-up at the bridge. You could definitely play this guitar on stage, and the LEDs do turn off.

After playing the Fretlight for many weeks, it became evident quickly that this is an incredible learning tool, taking much of the time and repetition out of finding a note on a music sheet and then having to locate it on the fretboard. I was also able to pick up riffs far faster than normal using M-Player. Whether you already play, quit because you found the process too frustrating, or have always wanted to learn, the Fretlight is an excellent investment if you have the means. ▲

by Blaine A. Flamig

Fretlight 421
\$599.95
Optek Music
www.optekmusic.com

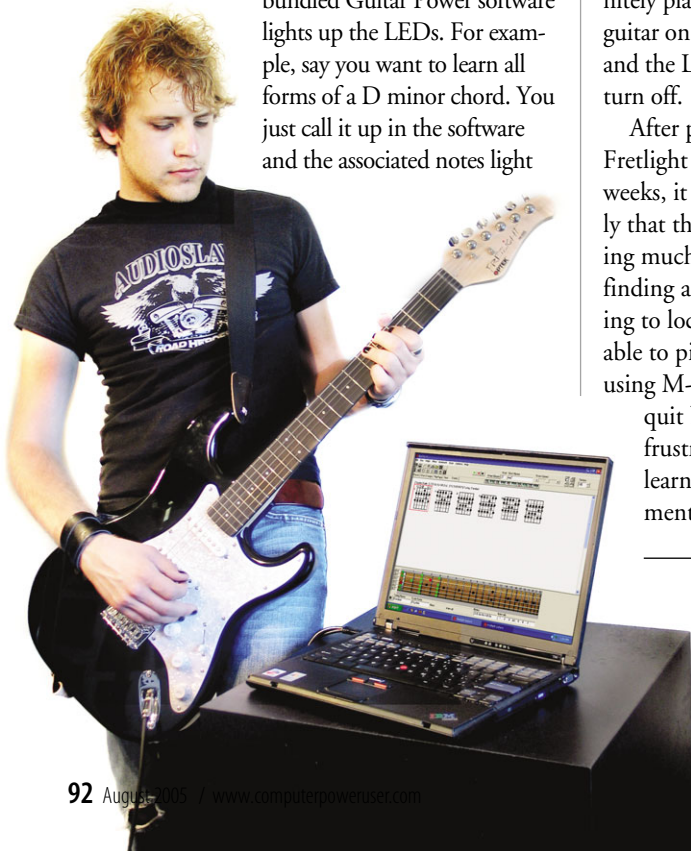
The Smokey: A Tasty Lil' Amp

It goes against a guitar player's nature, but there are times when you have to respect others' peace and quiet. Such was the case when we tested the Fretlight in our offices. Couldn't exactly plug into a stack of Marshalls, could we? Hence, we quieted things down the best way possible—we used a Smokey Amp from Zinky Electronics (www.smokeyamps.com).

The Smokey's genesis began decades ago as a mod-like project by Bruce Zinky. The world's smallest amp has since grown into a self-sustaining business that has catered to the likes of ZZ Top, The Rolling Stones, Foo Fighters, and others—all on the foundation of recycled cigarette packages, a 9V battery, and a two-inch speaker. The kicker is that the amp is small enough to fit in a front pocket, yet puts out impressive sound.

Why a cigarette case? Like any modder will do, Zinky used what was available. "We needed a box to house the components. The cigarette box has a unique look. Cigarette boxes are garbage and are available for nearly nothing . . . We didn't have any money to tool up a custom box when we started, so for the first year or two, they were all cigarette boxes."

Zinky also makes polycarbonate (inspired in part by iMacs), Supro (more distortion), and Custom Artist Series Smokeys. The former developer of Custom Shop high-end tube amps for Fender says, "Since the beginning, we've sold over 200,000 . . . all designed, assembled, and packaged in USA." If you take your guitar wherever you go, you need a Smokey. Polycarbonate models are just \$31.50; cigarette-pack models \$33.50.



WinXP Tip Of The Month

Microsoft Fights Malware

Microsoft now offers a way to root out major worms and system infections (updated with the latest definitions every month). At the Microsoft Web site (www.microsoft.com), type **KB890830** in the Search box to get a link to the Windows Malicious Software Removal Tool download page. You can scan your PC from the Web or via a downloadable version of the tool, but keep in mind that neither promises the kind of protection/detection of a memory-resident antivirus shield. ▲

Registry Tweak Of The Month

Tame The Regedit Maze

Try these shortcuts to easily navigate Regedit. Highlight a subkey and press the asterisk (*) on your numeric keypad to open all branches and sub-branches. Use the minus key (-) on the number pad to collapse all subkeys. If you're at the top of the Regedit tree (My Computer) with a mass of subkey branches open beneath, press the minus key to close all the subkeys. Don't use the asterisk key at any top-level keys because this opens every subkey in Regedit and may crash the program. If you need to close down branches quickly and start at the top, press and hold the left arrow key. ▲

SOFTWARE

TIPS & PROJECTS

Convert A DVD To PSP

Sure, owners of the Sony PSP can download preformatted MPEG-4/PSP video clips from Heavy (www.heavy.com), but where's the fun in that? Playing with the PSP means being able to rip, convert, and transfer your own media to this portable wonder. This month, we start big by moving a full DVD to our PSP.

Start Off

First you need Memory Stick Duo. We managed to get a widescreen DVD below 300MB, but in many cases you'll need a full 1GB stick. Keep in mind, however, that a gigabyte is not a gigabyte in the realm of MSDs. After formatting, expect to get considerably less usable storage space on your stick than the advertised 256MB, 512MB, or 1GB. Like hard drives, removable storage uses labeling conventions that don't reflect the actual memory, so keep this in mind when you select an MSD.

Rip Wisely

Though a combination of freeware tools, it's possible to rip and convert a full-length DVD to the PSP at decent quality. In addition to a 512MB or 1GB MSD, you'll need to download and install DVD Decrypter (www.dvddecrypter.com) and PSP Video 9

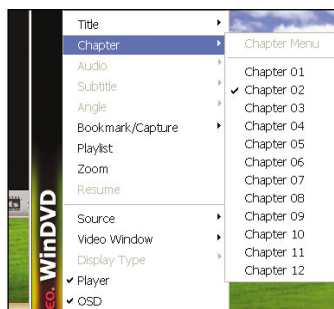
(www.pspvideo9.com). You'll also need a software DVD player such as WinDVD 6 (www.intervideo.com) and Apple QuickTime. Furthermore, do *not* decrypt and transfer any copyrighted material.

A DVD has title and chapter folders that contain raw film information, as well as menus, special features, and optional audio tracks. So, you first need to identify the vital video you want to convert.

With your DVD running in WinDVD, right-click the playback window to navigate to different title numbers in the DVD. In many DVDs, Title 1 is the main navigation menu and Title 2 contains the core movie data. Note the title number that contains the main film and use the chapters item in the same context menu to see how many chapters the main film contains. This will help you isolate the correct sections of your DVD for ripping with DVD Decrypter.

Load DVD Decrypter and use the Source drop-down menu to locate the DVD drive. Under Destination direct the output to a folder on your hard drive (give yourself a lot of room). Next, click Mode and IFO 1, and you'll see a directory tree of your DVD in the Input window. The VTS_XX branches should correspond to the title numbering found in the DVD player software. Double-click the VTS_XX

branch that contains the core video and highlight the PCG 1 branch beneath it. You'll know that you located the correct area of your DVD if the number of chapters in the PCG 1 branch corresponds to the number of chapters you found for this video in the DVD player. Make sure all the chapters for this PCG 1 section are checked.



To convert a DVD to PSP format, first use a program such as WinDVD to identify which title on the DVD contains the core video material.



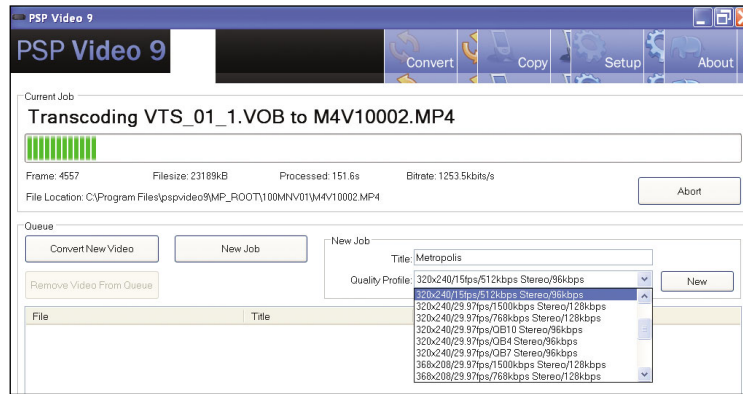
Now, go through the rest of your DVD's VTS_XX branches and their PCG sub-branches to uncheck any other chapters on the disk to ensure you copy only core video material to your hard drive.

Click the Stream Processing tab and check the Enable Stream Processing box. In the window below, uncheck all but the top video item and the audio track for AC3/2ch/English. Next, click Tools, Settings, and the IFO Mode tab. Under Options select None from the File Splitting drop-down menu and click OK. Click the DVD icon to start the DVD rip, which will produce a VOB file.

Conversion: The Big Wait

PSP Video 9 converts a VOB file into PSP-compatible MPEG-4 video, but you need to experiment with the right conversion settings to balance file size and video/audio quality. We took a 3GB VOB file and produced a MPEG-4 version in widescreen and stereo sound under 300MB. To do this, go to the Setup screen and click the Profiles tab and New Profile. Under Profile Name, give your custom profile a name. For a widescreen film, go to Video Settings and set Resolution to 368 x 208. Set your frame rate to 29.97fps. In the Bitrate box, check the Variable radio button. Use the Passes drop-down menu to set this item to Two. This runs the conversion through two passes in which the program decides how best to adjust the bit rate.

In the audio Settings window, set Bitrate to 48Kbps and Channels to Stereo. With the settings in the Profiles tab set, click Apply. Now click the Settings tab and use



In PSP Video 9 balances file size and media quality by converting a VOB file using preset or custom conversion profiles.

the drop-down menu to make your custom profile the default profile and click Save.

Click the Convert item in the main menu. Click New Job, use the file navigation box to highlight the VOB file that DVD Decrypter made, and click Open. In the New Job box, give your video a title. Use the Quality Profile drop-down menu to choose the custom profile you made earlier. Click New to start the conversion. When the transcoding is finished, you can attach your PSP to your PC, activate its USB Connection, and use the PSP Video 9 program's Copy menu to move the video file to your portable unit. The conversion program automatically creates the necessary video subdirectory on your PSP.

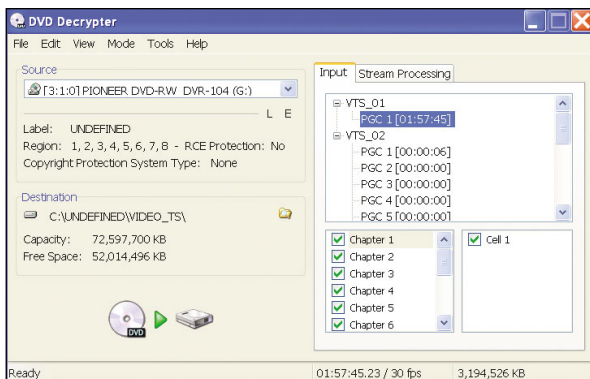
If you want to optimize video and audio quality, you can try using one of PSP Video 9's premade settings. For instance, we applied the 320x240/29.97fps/768kbps/Stereo128kbps profile to the same 3GB VOB file and got a 644MB video file.

There was little qualitative difference between the file we made earlier. We recommend experimenting with the lowest resolution and bit rate settings. Try to keep the frame rate at 29.97, however, because the lower setting produces jagged motion.

Most of these conversions take more than an hour to complete, but you can get a sense of how large the resulting files will be by opening the

PROGRAMFILES\PSPVIDEO9\MP_ROOT\100MNV01 folder. Even as the conversion process goes on, the program is writing data to an M4V10XXX.MP4 file. Mouse over the file so you'll know whether the file is getting too large for your MSD. If the file size is going over your limit, you can go back to the Convert screen in PSP Video 9 and click Abort to stop the conversion and restart with a lower video setting. When conversion is done, check the visual quality and content of this MP4 file by running it on Apple QuickTime. **COU**

by Steve Smith



DVD Decrypter lets you isolate the main video and audio tracks on a DVD to rip to the hard drive as a continuous VOB file.

Infinite Loop

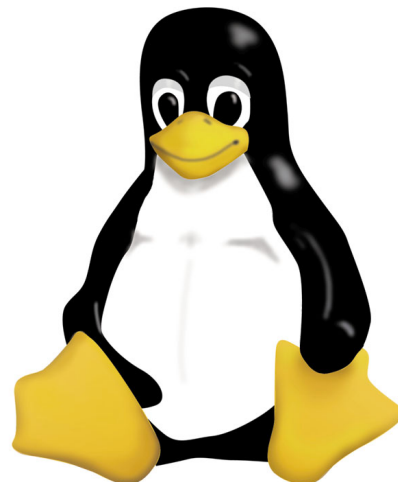
Do You Have The Time?

Do you spend so much time with your computer that you have become "one" with it? Well, then this may be the perfect gadget for you. The Binary Watch doesn't have a traditional dial or a digital display but gives you the time in binary code. Two rows of blue LED lights display the time. The top row (8-4-2-1) denotes hours, and the bottom row (32-16-8-4-2-1) denotes minutes. A light that's on equals 1, and a light that's off equals 0. Cool if you know code or not. ▲

Source: www.iwantoneofthose.com/WATBIN_GADG.htm



WARM UP To PENGUINS



Create OpenOffice.org Macros

Those of us who do a lot of work in word processors, spreadsheets, and other office applications often find ourselves doing work that requires a lot of repetition. To cut down on the chances of making errors (or just falling asleep from boredom), one option is to create and use macros, or miniature programs that can accomplish sometimes complex tasks with a single click or keystroke.

In OpenOffice.org's Writer program, there is a list of existing macros already installed. You can view these by clicking Tools, Macros, and Macro. In addition, there are three major ways to add other macros in OpenOffice.org. The easiest of these is to use the macro recording feature. Another way is to go to Web sites such as OOoMacros.org and download macros that have been previously written. The third method, which is by far the most difficult, is to use the OpenOffice.org Basic programming language to create macros by hand.

The Macro Recorder

The macro recording feature lets you create a macro without having to do any actual programming. Before you start using the feature, however, be sure you know exactly what you want to do, as everything you do from here on will be recorded by OpenOffice.org Writer. You'll access the feature by clicking the Tools menu, Macros, and Record Macro. When you are finished recording the macro, click the Stop Recording button. The Macro dialog box will appear.

Within the Macro dialog box, you can save the new macro by creating a name for it in the Macro Name field and then clicking the Save button. You also have the option of creating macro Modules and Libraries to help organize the macros you record. To explore how these designations interact, in the main OpenOffice.org Writer window click Tools, Macros, and then Macro. This will open the Macro dialog box (this version of the dialog box and the version you'll record macros in are slightly different). Now click the Organizer button to open the Macro Organizer dialog box to see how your macros are organized.

Find & Install External Macros

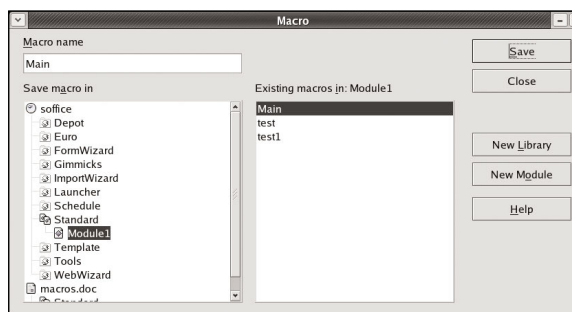
If the macro that you want to create is too complex to use the Macro Recorder and you're not the type of user to run out and learn a new programming language to create the macro, you may find that someone else has already created the macro for you, or at least one that you could slightly edit if you are willing to learn how. When you are hunting for OpenOffice.org macros, the first place to

turn is OOoMacros.org. (Many of the macros here will also work with StarOffice.) Most users will want to click the End Users link, which is where you will find macros that are ready to use already. More adventurous users may want to consider following the Developers link, where you can take a shot at programming your own macro.

On the End Users page, you will find a list of links and descriptions of the various macros available. If you decide that you want to try one, just click the associated Download link. This will take you to a SourceForge.net download page. Look in the list of links provided in the download table and find the most recent macro version, which should be at the top of the list. Beneath this version look for a link that begins with the word Download, such as Download writer_add2dic.sxw.zip.

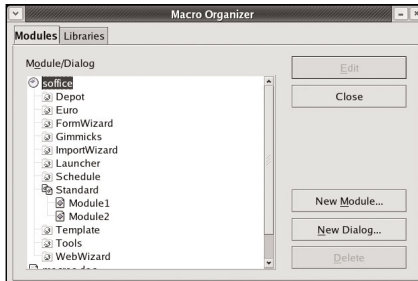
If you were to click this link, you would be routed to a server selection page. Use the Location and Continent columns to determine the best server to use and then click the Download link on the right for your selected server. Save the file to your hard drive and uncompress it using the unzip program (at a command prompt, type **unzip filename**, where *filename* is the name of the macro you've downloaded) or another tool that you prefer.

Once you have the file downloaded and uncompressed, open it as you would any other OpenOffice.org document. The Run Macro dialog box will appear. If you intend to download all trusted macros into the same directory for



The Macro dialog box is where you can save newly created macros or activate existing ones.





In the Macro Organizer dialog box you can arrange your growing macro collection so it is easier to work with.

use with OpenOffice.org, check the Add This Directory To The List Of Secure Paths checkbox. Otherwise, don't check the box. (Note that some macros may have viruses attached to them that can damage documents.)

Once you've decided to either use this folder or to not store your macros, click the Run or Do Not Run button. We'll click the Do Not Run button, as our object now is to install the macro, not to use it yet. The document itself contains not only the macro code but also some information about it, its license, how to install it, and more. Unfortunately, these instructions can be fairly advanced. If this doesn't appeal to you, there is another method for installing a macro that's loaded within a document.

With the document open, click Tools, Macros, and Macro to open the Macro dialog box. Click the Organizer button to open the Macro Organizer dialog box. In the Module/Dialog hierarchy tree, scroll to the bottom and you'll see the name of the current document with a hierarchy

tree leading to the name of the macro itself. Click the macro and drag it up the tree to the soffice/Standard library. Now click the Close button, and the macro should be installed in the application.

Assign Macros To Keystrokes & Events

Once you've created and/or installed macros, you may want a macro associated with a certain action or location. To do this click Tools, Macros, and Macro to open the Macro dialog box. Select the macro you want to work with from the list on the left and click the Assign button to open the Configuration dialog box. This dialog box contains tabs that you can use to choose exactly what type of event or keystroke should activate the macro. These include:

Menu—Lets you assign from which menu you can activate the macro. Clicking the New Menu button lets you create a new menu to attach the macro to.

Keyboard—Lets you view the actions already mapped to certain keys and change these settings by clicking Modify.

Status Bar—Lets you add or remove information to or from the status bar at the bottom of each OpenOffice.org application window.

Toolbars—Lets you customize existing OpenOffice.org application toolbars or create new ones to assign macros to various functions.

Events—Lets you choose an occurrence, such as opening a document, and assign a macro to run at that time.

In the Keyboard, Menu, and Events tabs, you'll need to specify which macro you want to work with. The Menu and Keyboard tabs work identically here. In the Category section, scroll to the OpenOffice.org Basic Macros entry and click the plus sign to expand it. Inside, click the plus sign next to Standard and click the macro you want. In the Function section, click the macro's name, as well. Now you can assign this macro to a menu or keystroke. For the Events tab, expand OpenOffice.org Basic Macros and then the Standard section and select the macro you want.

Macro Mania

There are lots of possibilities with OpenOffice.org's macros. Although some users might want to learn to program macros on their own, many users will be happy sticking with macros that they can record or download. Just make sure you download from official Web sites, where you're less likely to end up with a macro virus.

If you want to learn to program macros, going to the Developer's section at OoMacros.org and downloading Andrew Pitonyak's Macro Document is a good place to start. You'll also find a link to Pitonyak's macro programming book. **cpu**

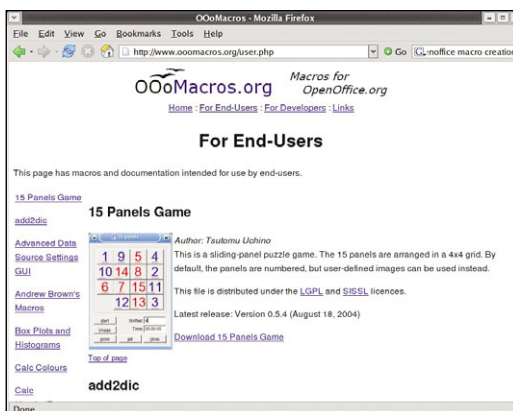
by Dee-Ann LeBlanc

Infinite Loop

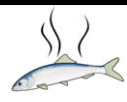
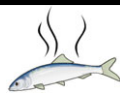
Get Dirty

Stop taking showers. In fact, throw out deodorant, cologne, and anything with a pleasant scent. You can now spend all your free time marinating yourself while playing World of Warcraft. UK and Swiss researchers have found that the brain can be tricked into thinking something smells good. During a test study, participants rated the smell of cheddar cheese and body odor, but both odors were cheddar cheese. The cheddar cheese odor was consistently rated higher than the body odor smell, even though the odors were identical. Researchers also scanned participants' brain activities with fMRI (functional magnetic resonance imaging) and found that the olfactory area was triggered when participants prepared to smell the cheddar cheese but didn't activate for the body odor. ▲

Source: www.abc.net.au/science/news/stories/s1371630.htm



The OpenOffice.org End User Macros page has many downloadable macros for your experimenting pleasure.



Rumour Mill

Intel Treads Water Until Apple Falls

We won't mention Apple's recent liaison with Intel in this column. Well, not much, anyway. Suffice it to say that we did see an internal document that Intel distributes to its own staff but not people like you and me, which had an air of such excitement about it that I almost came over all faint and swooned like a Victorian maiden. The smelling salts brought me round fast, don't worry. In that document was a firm statement that Apple would influence Intel's future roadmaps. That, of itself, is a highly significant statement. Dell is allowed, of course, to have its say on Intel roadmaps, but we detect a certain coolness in this relationship, possibly a warning to the hardware giant. In the meantime, Intel plugs ahead remorselessly on a now-familiar course that's dictated by a move in late 2006 to newer technology that Apple hopes to take advantage of, including the Yonah notebook processors which will be released in the first quarter of 2006.

I've long said in these columns that the Pentium M is a saviour for Intel, and we learned earlier on this year that this processor will form the basis of some really rather lovely machines which bridge the gap between desktop and notebook. The move to dual cores blurs—would it be absurdly cynical of me to say that this is probably what Intel and AMD intend?

Until Intel completes the rearchitecture of its entire microprocessor range, AMD has the drop on it, certainly in terms of performance. And AMD is also playing the price card for all it's worth right now (the X2 Athlon 64s are really very expensive chips). Intel is attempting to do its best by offering its dual-processor chips at a comparably cut-down rate. It will also be using its marketing might and muscle to ensure AMD doesn't do too well. Out there in the real world, we suspect the average consumer can't really tell the difference.

AMD recently took the unusual step of giving the analyst community a 163 slide presentation saying that by 2007 we'd all be thinking

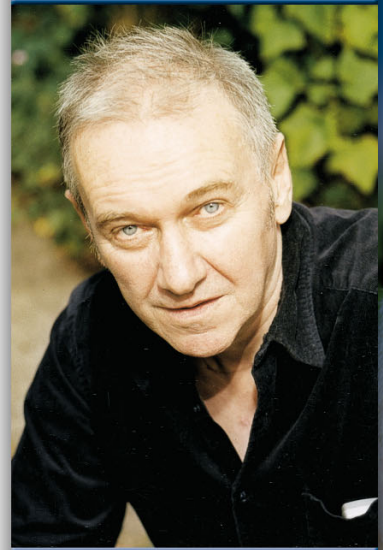
about PCI Express 2, WiMAX, and DDR3 memory. Some of us are still thinking about PCI Express number one, which is why the graphics companies are still making and selling AGP cards. Basically, Intel is going to continue selling its Pentium 4s for as long as it possibly can. The highest speed grade for the 6XX series will be 3.80GHz, and it will carry on selling those for much of next year, although they will be phased out by dual-core 8XX chips during the course of next year. But there are some different types of 6XX chips looming—these have odd numbers like the 663, 653, and 662 and are there to include VT ("Vanderpool" Virtualization Technology) and complete every tick box there remains to be ticked, including Hyper-Threading, EM64T and the NX virus protection bit.

In the first quarter of next year Intel hopes to migrate its process technology to 65nm from the now widespread 90nm and will introduce 9XX Extreme Edition Pentium 4s—all dual core on the Presler core. Basically, there's little change on the Intel desktop front until Q3 of next year, which is when the firm launches its Broadwater chipset family.

And in fact, if you relied on the crystal ball at Intel and at AMD, the whole future would start to get very cloudy in the third quarter of 2006 because that's when Microsoft is supposed to get really serious about Longhorn. The word on the strasse is that it isn't just Intel, NVIDIA, ATI, AMD, and others that are getting heartily sick of the rolling operating system that never seems to get finished, but every third-party manufacturer of memory and maker of peripherals in the entire IT universe.

Given that, is it any wonder that Apple's Steve Jobs dream Intel machine isn't likely to debut until 2007 and will likely continue to use the Mac OS X operating system? By endorsing Apple so publicly, we believe Intel has drawn a line in the silicon sand, and it wants Microsoft and Dell to understand that it's a person, too. ▲

by Mike Magee



Mike Magee is an industry veteran. He cut his teeth on ancient products like the Dragon and the Japanese PC platforms long before the IBM-PC won. He worked for a corporate reseller in the mid-'80s and saw the Compaq 386 sandwich box and every GUI known to humankind. Mike decided that the way to go was the Interweb around 1994 after editing PC mags in the late '80s and '90s. A co-founder of The Register, Mike started the chip-driven INQUIRER (www.theinquirer.net) in 2001. He has contacts from top to bottom in the business, spanning the entire chain, who help him root out interesting rumours and speculation.

... there's little
change on
the Intel
desktop front
until Q3 of
next year...

Send rumours to "Mad Mike" Magee at Mike@cpumag.com.

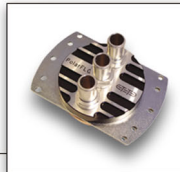
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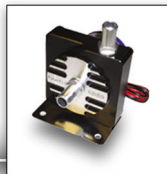
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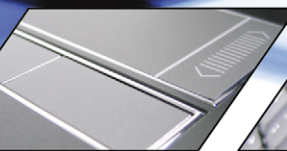
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The Hot Spot

Ferrari vs. Toyota

In recent years AMD has made some insane moves, from marrying 64-bit technology with Windows to creating strategic relationships with Ferrari and Lance Armstrong. These sponsorships were a great fit, and while its competition balked at such moves, AMD was maneuvering key pieces on its prolific strategy-puzzle.

One could speculate AMD's goals for sponsoring Ferrari. I believe AMD CPUs are the best, and I suspect AMD believes the same. By aligning with Ferrari, and continuing to make kick-ass products, AMD transformed from a "discount alternative" to a "superior brand" in a matter of a few product cycles. Ultimately, AMD emphasized you get what you pay for. The fact that Formula One racing is among the most watched spectator events in the world can't hurt either.

There's an age-old saying in the automotive industry, which was adopted by our beloved PC industry. For fear of butchering it, here's the gist: "If we win the race on Sunday, they will buy on Monday." In the early '60s, Henry Ford had it in his head that he must buy Ferrari in order to win LeMans. He wanted to prove to the world that Ford was still the best car manufacturer on the planet. He wanted to sell a ton of Mustangs.

After many arduous months of negotiating with Ferrari, there was a multimillion dollar deal on the table. Enzo was ready to sign, but at the 11th hour, backed out. Henry was ticked off—he lost a deal worth millions, risked losing respect amongst his peers, and, most importantly, took a huge shot to his ego.

Imagine if you will what it would take for you to spend millions just to embarrass someone you despised. Ford despised Ferrari, and he swore to spend as much money as necessary to wipe the floor with Ferrari in LeMans. So was born the Ford GT-40. The GT-40 is the only car in history to take first, second, and third places on the podium three years in a row. Ford pulled the plug shortly after he proved his point. There has never been another story like it in the history of racing.

Fast forward 35-plus years, and Ford tries to buy back the rights for the name "GT-40" from a Calgary resident (this is a funny story; it will soon appear on myVoodooPC.com blog, but you can email me for details). Instead, Ford releases the new Ford GT (though everyone refers to it as the redesigned GT-40). This car is one of the fastest vehicles on the road, second only to the Ferrari Enzo.

So back to the story.

Intel is definitely playing catch up in more ways than one. Nothing made this point clearer than Intel's recent me-too sponsorship of another F1 team. Previously, Intel balked at the AMD-Ferrari sponsorship, but now it's jumping in. A bit late isn't it? OK, so better late than never. Who would be the next logical choice? In a game of chess with a few pawns, you don't have much of a choice—unless you spend the time to study the pieces.

If I were in charge of running the Intel sponsorship team, I would *study my competition*. Therefore, you must understand the history of Ferrari. With some out-of-the-box thinking, it would be easy to find a team that echoes Intel's brand strategy like Ferrari does AMD's.

I would have worked with Ford, knowing that they have the new Ford GT out. Why not take an American company with American heritage and make a huge American comeback? Think about the potential marketing campaigns that could be written around this. Intel is blue, Ford is blue, and America is blue. A decision like this required some major thought; unfortunately for Intel, it missed the mark.

Instead of choosing Ford, Intel chose Toyota. (I'm still surprised.) Why would it parallel its brand with Toyota, even if Toyota wins an F1 race? Who cares if Toyota wins and what would this mean to us as consumers? That our PC has a Toyota CPU in it rather than a Ferrari? Perhaps, in a pinch, it made a last-minute decision, but where is the logic in such a sponsorship?

Anyone? ▲

by Rahul Sood



Rahul Sood's love for computers started at the young age of 11. Much to the shock and dismay of his parents, he ripped apart his brand new Apple IIc and painted it red before turning it on. His parent's dreams of having a doctor for a son were shattered when college drop-out Rahul founded what is now one of the most respected high-end computer companies in the world, Voodoo Computers.

I believe
AMD CPUs
are the
best, and I
suspect
AMD
believes
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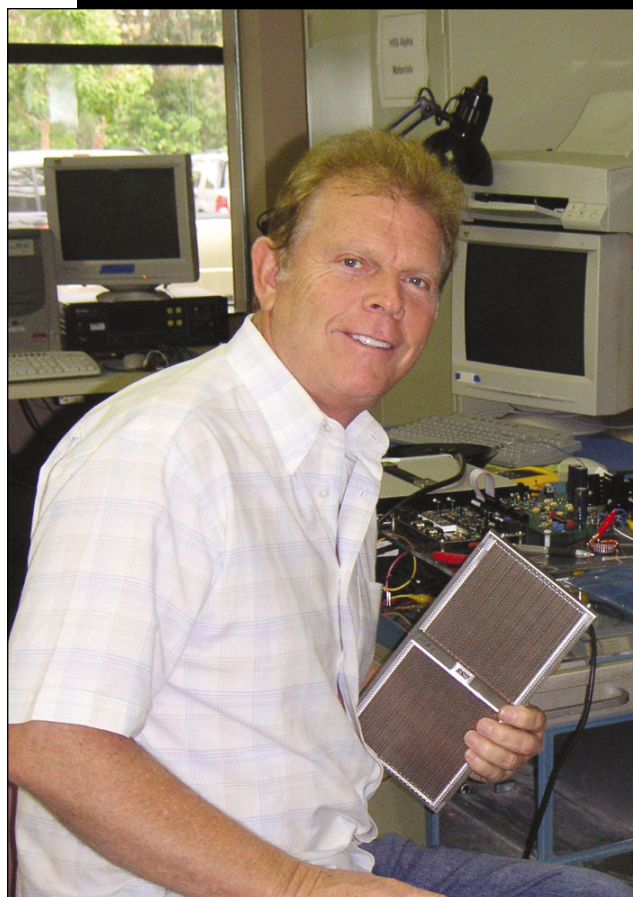
Send comments to Rahul@cpumag.com.

Technically Speaking

An Interview With Woody Norris,
Inventor & Chairman Of
American Technology Corporation

Bill and Ted went back in time and met some of the most influential people in history. But what if you happened to stumble over such a figure in the present, someone you might normally miss because he seems like just an ordinary guy? One hundred years from now, inventor Woody Norris may well be counted among the most influential minds of our era. Still, after spending time discussing everything from future transportation to fusion, we feel sure Norris would be just as comfortable poring over the details of roasting campfire hot dogs or gabbing about iTunes.

by William Van Winkle



CPU: How exactly does HyperSonic Sound [see July *CPU*, page 107] work?

Norris: By nature, ultrasound is very directional, the same as the high-end of your audio range, like up where your tweeter operates. That has a tendency to be real directional. Because of the short wavelength, higher frequencies become more and more like a beam. I figured out a way to multiply up in frequency the audio content you want until it becomes ultrasonic. When you do it right, you emit it into the air; it demodulates in the air itself and turns into audible sound. And as opposed to being made at one point, which is what happens with a regular speaker, it's made in the air at an infinite number of points along this ultrasonic column. It's like having a billion little speakers line up all pointing in the same direction. You can make audible frequencies without woofers and tweeters and crossover networks; no box, no magnets, and it's so clear, it's scary.

CPU: Is there anything in particular that helps you get your ideas?

Norris: Really, where we are right now technologically is we're putting a whole bunch of things together. Like with the cell phone: We got rid of the wires from a regular phone, made the antenna smaller, added a camera, and so on. We're just combining stuff. A lot of fundamental stuff has yet to be invented that's going to spark a revolution in invention.

What if you couldn't focus a light bulb the way we, until now, haven't focused sound? If you couldn't shape it and project it? Whole industries would disappear. The whole movie industry, not just Hollywood, but the theaters that we go to and the television industry would disappear. You wouldn't have TV sets. There'd be no computers with screens on them. Or CDs or DVDs—that's laser light.

Now, we've had conventional loudspeakers for 80 years. Yet, nobody gives much thought to the fact that the sound

goes where it wants to. I think sound is going to be in great measure analogous to what we do with light: put sound where you want it. It holds much greater potential for noise cancellation if you can control your sound instead of just using speakers the way they're used today.

CPU: You must have been born a salesman before an inventor. We asked you about where you get your ideas, and you turned it into marketing.

Norris: [laughs] My wife tells me that all the time. It just sort of happens. But let's talk about ideas. I look at practically everything I see and think of ways to improve it. I don't have one way I get these ideas. Sometimes they pop into my head while I'm driving my car, watching a movie, staring off into the distance. Sometimes I go at it deliberately. The AirScooter thing was a deliberate effort because I like to fly. So I said, 'OK, I'm going to figure out what I don't like

about airplanes and what I would like if I could figure a gadget that I would like to have.'

CPU: Honestly, the AirScooter concept makes us nervous because there are no lanes in the air.

Norris: Oh, you didn't see the '60 Minutes' show. They interviewed three or four inventors with flying machines and some guys at NASA. Now, the FAA wrote this regulation on ultra-light craft to encourage people to come up with flying machines. And I don't know if it was because it figured someday we'll run out of highways or what. But it turns out that as a result of this regulation, NASA has spent millions of dollars coming up with a computer program for a thing it calls the highway in the sky. You get a screen that you put on your flying machine. It projects a highway on the window in front of you or on the screen itself. It's like looking out the window and seeing a street with lines down the middle and signs on each side saying, 'This is the edge of the street.' Then you zoom out, the same as we do with GPS, and it shows you in real time if there's

Norris: Yeah. It has 12.5-foot blades, but because it's double blades, one above the other, it doesn't take a lot of rpms to get it going. It has a four-stroke engine running at a modest number of rpms. That was a big issue for me. I don't want a two-stroke engine going 10,000rpm to generate enough horsepower to lift me off the ground. A lot of thought went into the stuff you're asking about because the average person is going to be intimidated by things like that. Why somebody else didn't do this, I don't know. They were all too damn smart.

CPU: Were you college educated?

Norris: No, I found I was not disciplined enough and that I was learning a lot of things that I kept questioning what good they were going to be. So I said, 'I don't care about the credits; I care about the knowledge. I'm going to take what I want to.' I took electronics, calculus, accounting, philosophy of religion. I worked at the University of Washington for 11 years, so I got to take classes for free, except I'd buy my own books. So I have an education that's a little different. I never worried about a degree. But you

about gravity, and the first thing it tells you is we don't understand it. There's a reassessing going on right now in earnest as to the fact that we've not been able to unify the forces of nature and that for the last 20 to 30 years we've been going down the wrong path. So I think we're in for some huge advances in the next seven to 10 years that are going to change the world technologically. You get one of these discoveries, like when we discovered the electromagnetic spectrum. We're still exploding with revolutionary stuff from that. When we figure out gravity, it's going to be unbelievable, not just for space travel and cars, but for if you want to move a heavy desk across the floor or take your heavy groceries in the house. See what I'm saying? Controlling it! Wow!

CPU: Do you ever worry that in the pursuit of your larger ideas that you might go someplace that would have been better off left alone?

Norris: No. First of all, if I or somebody in our country doesn't do it, somebody in some other country will do it in secret, and we will be at a huge disadvantage.

There's a reassessing going on right now in earnest as to the fact that we've not been able to unify the forces of nature and that for the last 20 to 30 years we've been going down the wrong path.

-Woody Norris

another vehicle in the vicinity and alerts you to avoid. The other guy has the same thing. And so there's a great anticipation technically that some time or other in the future, we're going to be utilizing airspace.

CPU: What about the noise?

Norris: I weigh 220 pounds. The machine weighs about 250 to 260. To lift that machine off the ground, your blades are only rotating 800rpm.

CPU: That's it?

can't invent and not be educated. I just didn't get mine in the regular way.

CPU: You have said you want to do something new, break new ground.

Norris: I'm working on hydrogen. I'm working on gravity. And I'm spending my own money, sometimes some serious money. But think of this: We're in the 21st century. Look in any book or online

Because of that I don't believe our government is interested in suppressing this kind of stuff, and I don't think these big companies are so stupid as to think they're not going to have a place in this. They have all the money. So these things will be embraced. They're not going to be suppressed. In the old days, maybe, that might have happened, but I doubt it today. And if it happens to me, I've had a great life up to now, so who cares? **CPU**



Subscribers can read bonus content with Woody Norris at www.cpumag.com/cpuaug05/norris

Under Development

A Peek At What's Brewing In The Laboratory

by William Van Winkle

Lights, Camera, Re-Camera!

Using “dual photography,” Stanford electrical engineering Ph.D. candidate Pradeep Sen and other researchers have essentially been able to make a camera and light projector switch places. Imagine a room with only a statue in the center. You stand against one wall with a camera, and a projector illuminates the statue 10 feet to your right. The captured image is processed so that the scene looks as if you and the projector switched positions.

Dual photography works by analyzing how specially projected light patterns bounce off objects. Different patterns of black and white

games are generated from polygonal models, but there has been interest in using photographs of an actual scene to generate the environment, like in an architectural walk-through. If we properly capture the light transport through the scene, we can add virtual characters in this environment that cast shadows, etc. This could result in some pretty cool photorealistic games, as well as have application in fields like architecture, simulation/training, etc.”

The ideal is capturing the full 8D reflectance function of a scene, meaning 4D incoming light with 4D outgoing light. A normal camera captures 2D of outgoing light. An array of cameras together can capture a 4D slice of the total 8D function. This 4D slice can be used to view interpolation effects, such as in the bullet-time sequence in “The Matrix.” Dual photography enables the capture of a 6D slice.

“The goal . . . is to come up with techniques to capture the 8D reflectance function very efficiently, which is a challenge because it is such a huge data set,” says Sen. As an example of the size for a 6D slice, Sen describes one example of “16 virtual projectors of 600 x 800 resolution mapping to a virtual camera of 1,024 x 768 with three floating components per pixel. So it’s about . . . 65.9TB. Our acquisition algorithm automatically compresses the data set to about 100MB—as you might imagine, there is a good amount of redundancy in this function—but it’s still very large. However, having the capability to capture it and then to render it on a PC would allow people to capture ‘photographs’ that they can then pan around in, refocus, etc., using their computer.” ▲



The shots show an original scene captured from the side with a head-on light source (left) and then a dual-photography processed version, with the camera and projector positions artificially switched.

pixels are beamed at an object, and how the reflections of those pixels reach the camera determines the data set that can be processed. Dual photography can also have unexpected perks. Sen’s most famous demonstration is aiming the projector at the back of a playing card so the light reflects toward a book behind the card, not at the camera, which can only see the card’s back. After processing, however, Sen’s software can create a virtual image of the card’s front, based on the reflected pixels.

“The primary use of dual photography we’re exploring now is scene relighting,” says Sen, “where a real scene that has been captured can be relit with virtual objects. One of the examples we show is of an animated virtual character casting a shadow onto a real scene. This might be useful in games because it might allow game characters to interact with image-based scenes. You see, right now most of the environments in

Smart Plastics See The Light

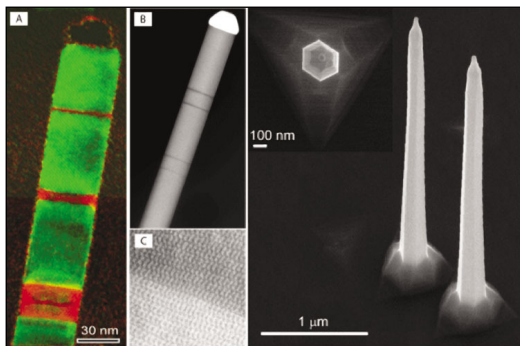
We’ve covered flexible displays in “Under Development” before, but here’s an interesting twist. Say you remove a rolled up display from your pocket and put it on a table. When you flash it with a specific light, the screen becomes flat. Flash it again and it rolls up. You’d never again have to worry about it accidentally unrolling and something spilling on its surface. Or imagine plastic drive rails that grip tightly in the dark of your chassis and unlock when you pull the drive out into the light.

MIT professor Robert Langer; Andreas Lendlein, institute director at the GKSS Research Center in Teltow, Germany, and others have devised a new class of “smart plastics” that deform and fix into a new shape when exposed to a certain wavelength of light. Langer and Lendlein have numerous polymer-related advances to their names. Thermoplastics with “shape memories” that respond to heat have been used for some time, but the men were the first to devise a biodegradable variant in 2001. Now they’re the first to elicit shape memory with light rather than heat.

The technology depends on photosensitive molecular switches being bonded to a polymer substrate. The plastic is stretched and doused in UV light of a key wavelength, causing the molecular switches to bond. These bonds (and the deformed shape) remain after the UV light and stretching is removed. Exposure to another certain light wavelength breaks the bonds, returning the plastic to its normal shape.

The team is considering medical and industrial applications, but Lendlein says “the nice thing about shape-memory polymers is that they may find applications in various areas, including in computer science.” ▲

Waste Not, Nano Hot



Heiner Linke and Tammy Humphrey's improved thermoelectric efficiency is still largely theoretical, but a collaborative experiment with other researchers will soon use nanowire structures like these (the color bands show different semiconductor materials) to prove their assertions.

because the heat flow is uncontrolled. However, the nano-structured materials that Linke and Humphrey have been able to develop—semiconductors that are

it that electrons jump over,” says Humphrey. “They are excited by the heat emitter to a high energy, they jump over this gap, and then they can be used to do useful work against a voltage. In computers you would need a really high-efficiency material to make it worthwhile to recycle waste heat. If you could make a material that operates with an efficiency of, say, half the Carnot limit, then you could in principle recoup roughly 17% of the heat from a CPU.”

Linke and Humphrey believe their design will achieve about 50% of the Carnot limit. Previous CPU-sized designs have realized less than 15%. Humphrey hopes that by combining their work with similar research projects, the technology can be commercialized in three to five years in such areas as computing, car engines, and geothermal hot springs. ▲

Enthusiasts spend a lot of time and money getting heat out of their systems, but what if you could tap into those scalding processor surfaces and turn that wasted heat into energy?

Thermoelectrics is nothing new. The problem, though, has been that the conversion efficiency that different experiments yield has been too low and the costs too high to make the technology feasible. Professor Heiner Linke of the University of Oregon and Tammy

Humphrey, a post doctorate fellow at the University of New South Wales in Australia, have made a breakthrough that may make thermoelectrics a popular reality.

The pair's discovery hinges on the laws of thermodynamics, which state that heat will always flow to cold, until a balance of temperature is achieved. In the process, the energy expended by electrons is lost as waste. Conventional thermoelectric materials have a hard time capturing this waste

riddled with nanowires—can bring order to the electrons' movement. Only electrons with a specific energy are allowed to flow through the material, meaning electrons can't shuffle heat to cold areas. Thus, a sort of equilibrium is forced between the two regions. In fact, because the regions are in equilibrium, the electron flow is reversible, making the device much more efficient than prior approaches.

“We have a semiconducting material with an energy gap in

Philips Out-Flashes Flash

Whenever you spin up a CD or DVD, you are using phase-change memory.

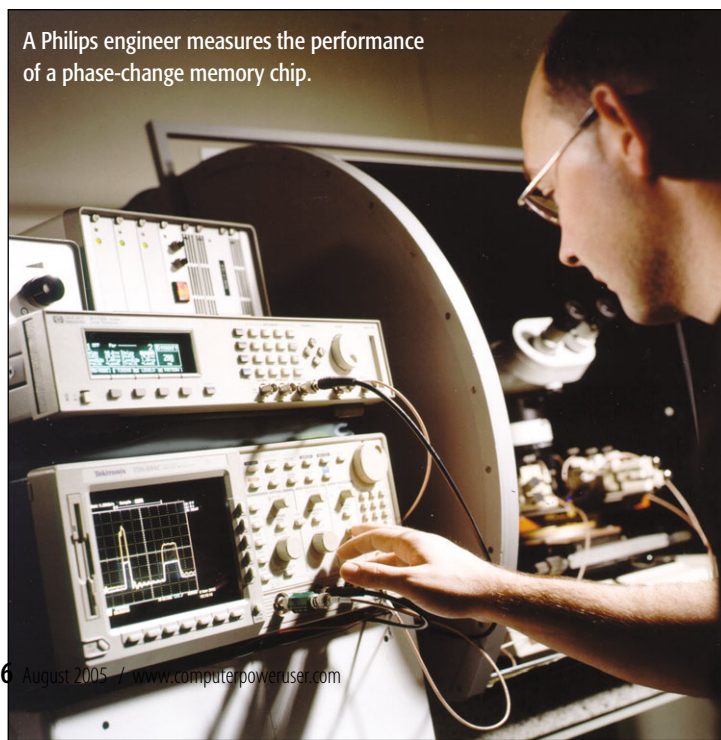
Phase-change materials are what deform in the discs when a laser hits them, shifting from

amorphous to crystalline phases and exhibiting different reflective properties accordingly. Philips is now working on making solid-state memory by applying a thin film layer of phase-change material on a silicon substrate. Electrical charges deform the material while resistance reads its state.

Unlike other memory technologies that have trouble scaling down in size, Philips' “line-cell” approach requires less voltage as feature sizes decrease. Better yet, phase changes can occur in about 30ns, more

than 100 times faster than a flash memory cell can change states, and line-cell chips can be made almost entirely using conventional chip fabrication methods.

“The holy grail of the embedded memory industry is a so-called unified memory that replaces all other types, which combines the speed of SRAM with the memory density of DRAM and the nonvolatility of Flash. Philips' new phase-change line-cell technology is a significant step toward this goal,” says Dr. Karen Attenborough, project leader of the Scalable Unified Memory project at Philips Research, in a statement. ▲



A Philips engineer measures the performance of a phase-change memory chip.

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Q&A With Fred Weber

Since launching the Opteron, AMD has been tearing away headlines and gaining market share from Intel. Although no one person can claim responsibility for AMD's vaulting success, CTO Fred Weber—mastermind of AMD's x86-64 vision, architect of the “x86 Everywhere” initiative, and would-be greenhouse guru—tops the short list of chief contributors.

Q Intel thought x86 carried too much legacy baggage to live forever in servers and workstations. What compromises did AMD settle on when adopting x86-64 for Opteron?

FW With x86 the initial architecture didn't have enough registers, and this can therefore limit what a compiler can do. Floating point performance with x87 is also suboptimal. So we added more registers and didn't treat the new registers as part of the stack. I'd estimate that one tenth of 1% of the current x86 generation is really dealing with legacy issues.

You know, brainstorming on a clean sheet of paper is great for finding a ‘perfect’ solution. But once you come up with that solution, and this is a step that many people don't do, you should go back and see if there is some way these new ideas can be added to the existing design. Nine times out of 10, you can find a way to add these brilliant innovations to what is already in use. This ensures backward compatibility, which is huge for larger markets.

Q What's your take on Cell architecture?

FW Cell is interesting in that it points toward where we will eventually go as an industry, but it's not the right implementation. I am a big believer in parallel processing. I just see a huge need for that kind of computing

power being brought to bear on big computing problems. One of the ways that we can get there is by what I call heterogeneous multiprocessing, where some of your processors are big and can do one thing very fast, and some of your processors are small and agile and you have a whole bunch of them. Think of it as a herd of elephants and a colony of ants. Each is good at certain things. I think that there's a good chance, call it 60/40, that a mixture of both of those on the same chip will make sense over the next decade.

Now we're just barely scratching the surface of putting two identical processors on a chip right now. The Cell not only has two different types of processors on the same chip, but those processors have significantly different programming models. I think it makes a mistake in doing that. The things that will succeed will have much more of a homogeneous programming model while having a heterogeneous capability.

Q What are the top three items on your dream list of CPU innovations?

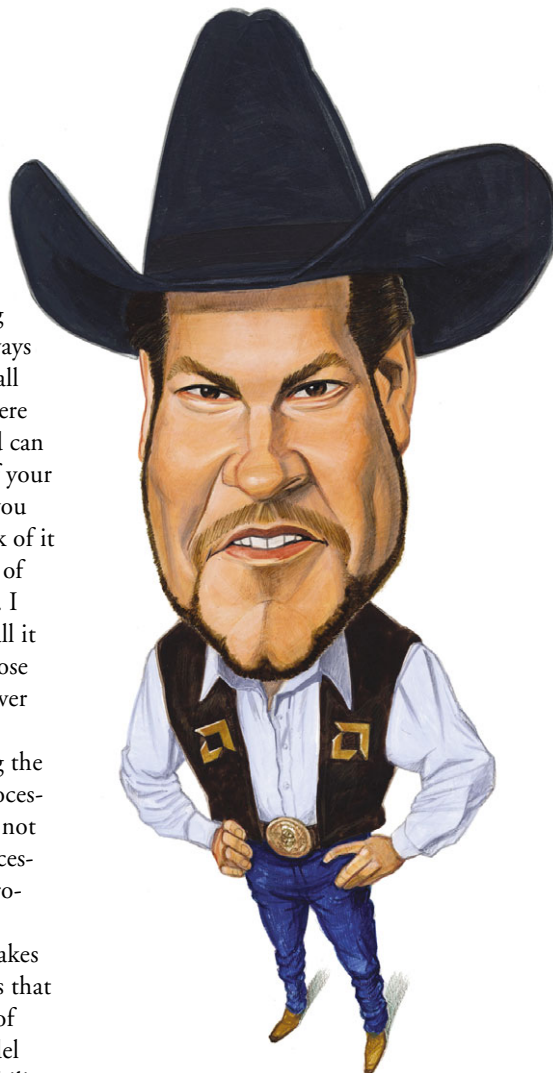
FW Well, I'm thinking a lot about heterogeneous multiprocessing right now. The other area that is of great interest but there isn't a solution for right now is how to best automatically, whether in hardware or software, use multiple threads in order to speed up programs that are not traditionally parallel. There are a bunch of techniques, such as run-ahead processing, being investigated. But there's no obvious solution right now.

For me, the most interesting thing is the idea of “x86 Everywhere.” We know how to build a whole range of processors, but there aren't enough different types of x86 processors to serve all the different needs: set-top boxes, digital TVs, computers, laptops, servers, supercomputers, etc. etc. Frankly, we know how to build most of the processors that

we need to serve those needs. It's a matter of getting together enough resources and energy to build all of those different processors. So a lot of it at this point is more focused on execution than invention. That isn't to say that we don't have to do a lot of invention, and you'll see a lot of innovation around more integrated processors, higher-performance larger multiprocessors, virtualization, and security. However, it's a neat time because while we're doing all of that, there's also this opportunity to just build many, many new devices.

Subscribers can go to www.cpubmag.com/cpubaug05weber for bonus content.

William Van Winkle began writing for computer magazines in 1996. He was first published in 1990, the same year he took his first job in computers. He and his family live outside Portland, Ore.



Dual Core Computing

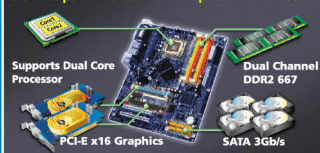
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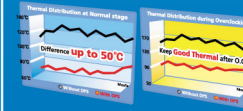
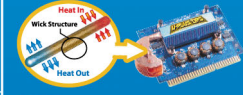
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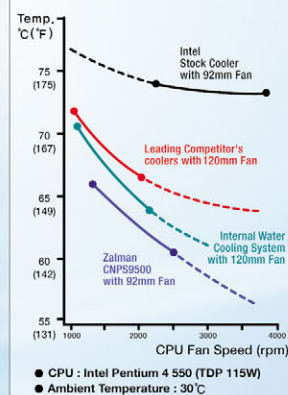
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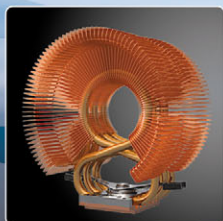


CNPS9500 LED Ultra Quiet CPU Cooler

Performance Comparison Chart



● Ultimate Performance



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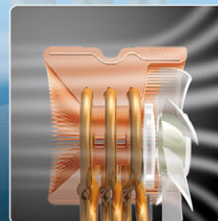


Innovative patented heatpipe bending design for a heat transfer capability equal to 6 heatpipes with just 3 heatpipes

● Ultra Quiet Operation



Ultra Quiet CNPS 92mm opaque fan with blue LEDs



Aerodynamically optimized heat sink for smooth airflow and minimal noise

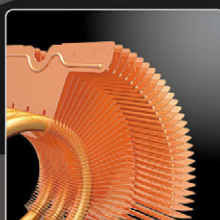
Specifications

Dimensions (L X W X H)	85 X 112 X 125 mm (3.35 X 4.41 X 4.92 inch)
Heatsink Material	Pure Copper Base Pure Copper Fins Pure Copper Heatpipes
Weight	498g (17.56oz)
Dissipation Area	3,498cm ² (542.19 inch ²)
Fan Size	92 X 25 mm (3.62 X 0.98 inch)
Fan Operating Voltage	5~12V
Rated Current	0.35A
Max. Power Consumption	4.2W
Bearing Type	2-Ball Bearing
Fan Speed	1,350 - 2,600rpm ±10%
Noise Level	18.0 - 27.5dB ±10%
Connector	3-Pin
Fan Speed Controller	FAN MATE 2

● Minimized Weight



Optimized heatsink layout for maximum cooling efficiency with minimal materials



0.2mm ultra slim fins for minimized weight and reduced airflow resistance

● Broad Compatibility



Intel Pentium 4 (Socket 775/478)



AMD Sempron/AMD64 (Socket 754/939/940)

